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FOUNDRY
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Continental Musings

The last week we have met quite a number of Europe's leading foundry owners—Belgian, Dutch, French, German and Italian—and a topic of conversation has been as to whether employers' associations should—be they European or national—undertake activities normally entering into the province of the technical institutes. We have been convinced that it is not merely a question of providing fields of activity when commercial matters tend to flag, but rather that the solution to technical problems can be more quickly and satisfactorily obtained when an order is given to paid officials to get on with the job. The foundry industry, both nationally and internationally, needs enlightenment on many aspects of its activities and we care but little who produces the results, so long as they are forthcoming.

We took the opportunity of visiting a few of the largest foundries in Belgium and were agreeably surprised to find the great progress made since the last war in the provision of amenities. They are in every way comparable with the best this country can offer. Naturally, they are oriented to meet the needs and customs of the country, such as coffee replaces tea, and as the men prefer home to canteen cooking, they bring their own food to well appointed dining rooms, where meals can be heated and, in some cases, a bowl of soup can be bought.

Amongst interesting developments noted was refuse removal, using a double-shuttered door, a special pan-handling lorry and a depressed area inside each door into which fits an eight by twelve-foot shallow receptacle for receiving rubbish. The lorry, by a special mechanism driven from the driver's cab, suspends an empty pan and racks out to place it in the foundry and then similarly takes away a load of rubbish. Such an attachment erected on a secondhand lorry would not be an excessive outlay for a small group of neighbouring foundries and would certainly pay dividends. A second innovation we saw was for the fume extraction of pit-fired furnaces. Connected with the main fume-extraction duct were hinged—at the sides and top—strong sheet-steel open fronted boxes. When casting, the moving away of the hinged portions gave ample working space for removing the pots. It is becoming increasingly evident that to get the best out of hot-blast cupolas, continuous runs are needed. In one case, in Belgium, a 150-ton mixer is being installed to service both iron and steel foundries, whilst in another, pig is cast for use in associated foundries or when the main plant is shut down. A new plant carries a hot and a cold-blast cupola side by side. Will the effluents from such a plant be subject to the control of the Belgian Alkali Inspectorate or the local town council or both?

Because international foundry congresses have recently been so well patronized, there were rumours that Liège was too small to accommodate all the would-be visitors, when this city is to be host next autumn. This is not true. The situation at the moment is that there have been 600 registrations, whilst the organizers have 1,000 rooms available, with the possibility of expansions. The majority of the foundry owners operate but modest concerns and we can assure them that there is much to learn from their Belgian colleagues.

Non-destructive Testing Summer School

A Summer School on the "Principles and Practice of Non-Destructive Testing" intended to benefit senior and chief inspectors from industry, is to be held in Manchester from September 8 to 12, and applications for places are invited. This Summer School has been sponsored by the British National Committee for Non-Destructive Testing and is being organized by the Manchester College of Science and Technology, the Manchester Association of Engineers, and the Institution of Engineering Inspection. The organizing lecturer is Dr. J. H. Lamble of the Manchester College.

In designing the course, it is expected that those attending will have some basic knowledge of non-destructive testing techniques, and the physical background, with interpretation of test results, will be dominant themes. In addition to lectures on the theory and practice of the various non-destructive testing techniques, there will be talks on statistical quality control, on the economics of non-destructive testing and on the collection of data. There will also be laboratory demonstrations of test equipment and a visit to a large works where non-destructive test methods are employed. Considerable interest has already been shown in the Summer School, by the inspection departments of industry and various Ministries and, as capacity is limited, it is advisable to make early application for places.

Accommodation for those attending will be provided in the residential quarters of Hulme Hall. The total cost of the course is expected to be approximately £18 0s. 0d. The lectures will be held in the Mechanical Engineering Department of the Manchester College of Science and Technology.

The provisional programme is as follows:—

Monday: Afternoon—Opening of the course by the organizing lecturer, followed by "Non-destructive Testing as an Inspection Tool from the point of view of Management," by Mr. E. W. Colbeck, M.A., F.I.M. (Hadfield's Limited, Sheffield). *Evening*—"Scope of Non-destructive Testing," by J. Thewlis, D.SC., F.INST.P. (Atomic Energy Research Establishment, Harwell).

Tuesday: Morning—"Theory of Radiography," by Professor H. S. Lipson, D.SC., F.INST.P., F.R.S. (Faculty of Technology, University of Manchester), and "Theory of Isotopes," by Mr. J. F. Cameron (United Kingdom Atomic Energy Authority, Harwell). *Afternoon*—"Applications of X- and Gamma-ray Techniques," by Mr. L. Mullins, M.SC., PH.D. (Kodak, Limited, London), and "Safety in the use of X- and Gamma-rays," by Mr. J. S. Blair, D.SC., M.I.MECH.E. (Stewart and Lloyds, Limited, Corby). *Evening*—Open discussion on X- and Gamma-rays, with Dr. Mullins in the chair.

Wednesday: Morning—"Theory and Practice of Ultrasonic Propagation"—Parts I and II, by Mr. J. Lamb, PH.D., M.SC. (Imperial College of Science and Technology, South Kensington). *Afternoon*—"Applications of Ultrasonic Testing," by Mr. B. R. Byrne (British Transport Commission, Derby), and "Eddy Current Methods," by Mr. E. G. Stanford, M.SC., PH.D. (Aluminium Laboratories, Limited, Banbury). *Evening*—Open discussion on Ultrasonics, with Mr. Byrne in the chair.

Thursday: Morning—"An Introduction to Statistics," by Mr. E. D. Van Rest, M.SC. (Ministry of Supply, London), followed by laboratory demonstrations. *Afternoon*—Works visit.

Friday: Morning—"Theory and Practice of Magnetic Methods," by Mr. J. Johnson, B.SC. (Metropolitan-Vickers Electrical Company, Limited, Manchester), and "Penetrant Methods," by Mr. W. G. Cook, B.SC. (Rolls-

(*Continued at foot of col.* 2)

Royce, Limited, Derby). *Afternoon*—"Economics of Non-destructive Testing, and the Collection of Data," by Mr. G. Goddard, M.ENG., F.I.M. (Aeronautical Inspection Directorate, Harefield). Finally there will be an appraisal session with member participation, and a summing-up from the chairman of the British National Committee for Non-Destructive Testing, Mr. C. H. Stanger, A.M.I.C.E., A.I.STRUCT.E. All enquiries concerning the Summer School should be addressed to the registrar, the Manchester College of Science and Technology, Manchester 1.

Meehanite Research Institute Conference

The 26th annual conference of the Meehanite Research Institute was held at the Hotel Majestic, Harrogate, on May 28 and 29. It was a British Institute conference and, therefore, was attended mainly by representatives from the UK, the purpose being to hear and discuss recent developments in Meehanite practice. Separate sessions were devoted to sales and engineering, new developments and foundry operations.

Mr. E. K. Gould, president of the UK section of the Institute, in opening the conference gave particulars of the proposals for reorganizing the Institute and these were adopted. Among the new arrangements were the formation of working groups interested in marketing, research, production efficiency and training.

At the sales and engineering session, reports on product development, sales development and work-study were discussed. Examples of product development were considered in detail as contributed by Meehanite producers from British and European foundries. The session on new developments included a report on further progress with the injector for molten metal, used for obtaining a wide range of properties from a base iron. A report was made on a new type of metal having interesting abrasion-resisting properties. In the session on foundry operation, considerable interest was shown in a report on the economies obtained in using a water-cooled basic lined cupola. A report on air-setting cores was also discussed, in which increased efficiency was reported to follow on adoption of this technique.

Members were entertained to dinner in the Ballroom of the Hotel Majestic on Wednesday evening, May 28. Arrangements for entertaining the ladies accompanying members included outings to Harewood House and Fountains Abbey.

Royal Counties Show

The Royal Counties Agricultural Society and the Hackney Horse Society are holding their annual "Great Show" at Winchester from June 18 to 21. On the first three days it will be open from 9 a.m. to 8 p.m. and on Saturday from 9 a.m. to 6 p.m. In addition to the show proper, there will be many acres devoted to trade stands at which will be displayed *inter alia* agricultural machinery and equipment for the farm, dairy, garden, etc. Founders amongst the country's agricultural engineers and those catering for dairy industries will doubtless be exhibiting. Other features include tractor driving competitions.

New French Iron and Steel Research Facilities

There has recently been opened at Maizières-les-Metz a research laboratory designed to carry out investigations on the general subjects of iron-ore and steel. For the latter, there is a melting shop, spanned by a 20-ton, overhead travelling crane with a five-ton auxiliary hoist, where metal is furnished by a six-ton electric furnace. The whole installation is described and illustrated in an 18-page brochure.

Corrosion-resistance of Spheroidal-graphite Iron

F. L. LaQue

In the following abstract the corrosion-resisting properties of spheroidal-graphite iron are examined against the practical background of actual use. Thus, the author comments not only upon such metallurgical considerations as composition and internal structure but also examines the performance of s.-g. iron with regard to resistance to acid corrosion, and to corrosion by marine, atmospheric and underground environments of various kinds. In conclusion, he underlines the particular usefulness of the material on tankers.

General Comment

Spheroidal-graphite iron is a high-carbon cast ferrous material having a composition generally the same as that of grey iron. A small addition of magnesium causes the graphite to take the form of spheroids rather than the conventional flake or plate form characteristic of grey iron. The almost continuous network of flake graphite particles in grey iron is the major factor controlling its mechanical properties and is responsible for its relative weakness and lack of ductility. S.-g. iron, with its spheroidal form of graphite, in which the surface area to volume ratio of the graphite particles is at a minimum, presents a continuous matrix of iron with only minor discontinuities due to the presence of the graphite particles. The structure of the iron matrix can be controlled by compositional variations and heat-treatment to produce properties ranging from 26.8 tons per sq. in. tensile strength with high ductility; *i.e.* over 20 per cent. elongation, to over 67 tons per sq. in. in tensile strength with 2-4 per cent. elongation. In many cases resistance to corrosion is a minor factor in the choice of the ordinary varieties of s.-g. iron for a particular use. In others which can benefit from the protective effects of its corrosion products and galvanic protection from associated steel, it may be a main factor in its use. This is important enough in most applications to warrant this review.

Electrochemical Effects

The internal structure of a metal can have a considerable effect on the corrosion reactions and especially on the distribution and path of the corrosive attack, and on the nature and adherence of the corrosion products. It is useful, therefore, to start this discussion by reference to the internal structures of ordinary grey iron and s.-g. iron, pearlitic and ferritic s.g. iron, mild steel and malleable iron.

For purposes of this discussion, the points to be observed in comparing these structures are: (1) The difference in shape of the graphite carbon in grey iron and s.-g. iron and especially the distribution of the graphite particles as well-separated discrete particles in the s.-g. iron as compared with overlapping and interconnecting flakes in the ordinary iron. (2) The difference in the matrix surrounding the graphite spheres in the pearlitic as compared with the ferritic s.-g. iron. (3) The difference between all the cast irons and mild steel where, in the latter, all the carbon is in a combined form usually as pearlite, whereas in the cast irons a large portion of the carbon exists as graphite. (4) The similarity of s.-g. iron to malleable iron.

These differences in the amount of carbon present and the form in which it occurs are principally responsible for observed difference in the corrosion behaviour of cast iron and steel. The counteracting forces that generally determine how fast corrosion will proceed are involved principally in the chemical and electrochemical reactions which occur at the anodic and cathodic surfaces. In most environments of practical interest in the use of iron and steel, the reactions which occur at the cathodes are more important in determining the rate of attack than those which occur at the anodes. Since the carbon in the irons and steels, whether it exists as graphite or as carbides, is much more noble than the iron matrix, it regularly acts, along with oxide films on the metal surfaces, as cathodes in the corrosion current circuit. Therefore, the activity of these cathodes becomes of prime importance in understanding the corrosion behaviour of the materials under consideration.

The distribution of the graphite is also important. Since corrosion tends to penetrate along the margins of the graphite particles, the rate and extent of such penetration can be expected to be less when the graphite occurs as discrete spheroids with random distribution, as in s.-g. iron, than when it exists as interconnected or overlapping flakes, as in grey iron. This will give s.-g. iron an advantage over grey iron.

Effects of Graphitic Carbon

Since graphite is insoluble in the environments in which any of the cast irons is likely to be used, it is natural that, as corrosion proceeds, the graphite in the iron will be left as a residue adhering more or less firmly to the, as yet, unattacked iron beneath. The graphitic layer, with its intermixed insoluble corrosion products, etc., can become so impermeable to the further penetration of corrosive liquids that it will form an excellent protective coating which can stifle any further attack. Under such circumstances, the cast irons will be much more durable than steel which is unable to protect itself in this fashion.

* Presented March 20, 1958, at the 14th annual conference of the National Association of Corrosion Engineers at San Francisco, California, March 17 to 21, 1958.

Corrosion-resistance of S.-g. Iron

On the other hand, if the graphitic layer remains permeable to the further penetration of corrosive liquids, the attack of the underlying iron will not only continue but may proceed at a rate accelerated by the galvanic effect of the graphite layer which acts as an enlarged cathode to supplement the other cathodes within the structure of the underlying iron. Where this occurs, the cast iron will corrode much faster than steel.

In some instances, the so-called graphitic corrosion of cast iron can proceed until nothing but the graphitic-corrosion products remain. These may retain the shape and original volume of the corroded iron object which may, upon casual inspection, appear to have suffered no damage. Since the graphitic-corrosion products are much weaker than the iron, the ability of the corroded iron to withstand stresses or carry a load will be reduced very greatly. However, some strength will remain. For example, pipes buried for 24 years in soils in which the original cast iron had been locally converted almost completely to graphitic-corrosion products were shown to be still capable of holding liquids under a pressure of 400 lb. per sq. in. Similarly long service has been observed in cast-iron pipes submerged in and carrying sea water, as for example in an installation at Nice, made in 1904 and still in use after 50 years.

The variable effects of graphitic-corrosion products, as between conferring complete protection from further attack, at one extreme to a gross acceleration of attack at the other, plus the ability of these corrosion products themselves to perform the functions of the original iron under some circumstances, provide the basis for such controversies as exist about the relative merits of cast iron and steel as corrosion-resisting materials.

Long-time tests that will answer these questions are in progress. In the meantime, results of tests already completed show that the chance of satisfactory behaviour is good enough to encourage the practical use of s.-g. iron as a substitute for grey iron, malleable iron or steel, for example, in underground service where the proponents of each of these materials claim advantages over the others.

Galvanic Behaviour

Prior to the acquisition of a layer of graphitic-corrosion products, the electrochemical potentials of s.-g. iron, grey cast-iron and steel will be about the same. All of these forms of iron can be made more noble by alloying with more noble elements such as nickel and copper than can be held in solid solution.

Iron containing a small amount of nickel as an alloying element can be made more noble than mild steel by 50 millivolts or so. This potential difference can achieve substantial cathodic (galvanic) protection of alloyed iron when used in electrical contact with an appropriate area of mild steel *i.e.* an equal or larger area of the latter as for example in the case of s.-g.-iron heating coils in salt-water ballasted cargo spaces on tankers. Once either grey cast iron or s.-g. cast iron has acquired a layer of graphitic-corrosion products, much more complex galvanic relationships can develop. Contact with other less noble metals such as mild steel will reduce the normal corrosion of s.-g. iron or grey cast iron to the extent that these other metals furnish part of the current required to polarize the graphitic-corrosion products to a potential close to that of the iron under the graphitic layer. In the particular case of heating coils in tankers in services such as transporting Middle East crudes where steel coils are subject to severe pitting of the upward-facing surfaces, the presence of graphitic-corrosion products on s.-g. iron may be largely responsible for their superior performance.

Resistance to Acid Corrosion

Investigators have reported results of tests in acids which generally show some advantage of s.-g. iron over grey iron and steel and of s.-g. iron with a ferritic matrix over s.-g. iron with a pearlitic matrix. Tests in 5 per cent. by weight air saturated sulphuric acid at 86 deg. F. for 24 hours in the Inco-Research Laboratory at Bayonne, N.J., yielded the results in Table 1.

Whilst the rate of corrosion of annealed s.-g. iron is still too high to permit its use in such a strong acid as 5 per cent. sulphuric, the results of the tests in this medium suggest that when there is to be an exposure to an even weakly acidic solution, s.-g. iron can be expected to perform better than grey iron and that the greatest improvement will be achieved when the s.-g. iron is annealed to provide a ferritic matrix. The probable advantage of annealed s.-g. iron will be greater where there is enough turbulence to remove graphitic-corrosion products as they are formed so that the indicated differences in corrosion rates will persist. If graphitic-corrosion products should accumulate, the initial differences in corrosion behaviour will become less evident and the rates for the different irons will approach each other.

TABLE 1.—*Tests of s.-g. Iron and Grey Iron in 5 per cent. Sulphuric Acid Saturated with Air at 30 deg. C.*

Material.*	Corrosion rates.	
	M.D.D.†	I.P.Y.‡
Unalloyed s.-g. iron (as cast with pearlitic matrix)	27,000	5.4
Unalloyed s.-g. iron (annealed with ferritic matrix)	16,000	3.2
Unalloyed grey cast iron (as cast with pearlitic matrix)	33,000	6.6
Unalloyed grey cast iron (annealed with ferritic matrix)	40,000	8.0

* Specimens moved at 16 ft. per min. for 24 hours.
† M.D.D. = milligrams per square decimetre per day.
‡ I.P.Y. is equivalent penetration in in. per year.

The similarity in corrosion rates of different irons in neutral or slightly alkaline solutions is illustrated by laboratory tests in 3½ per cent. sodium chloride with results as shown in Table 2. Comparing these results with those from the tests in sulphuric acid in Table 1, it will be observed that there were no significant differences amongst the several irons in the salt solution, whereas there were considerable

differences in the tests in the acid. Tests in fresh water yielded results generally similar to those in the sodium-chloride solution.

Corrosion by Sea Water

Seawater is ordinarily slightly alkaline so that laboratory tests in natural or synthetic sea water regularly fail to show any significant differences amongst the various types of iron. This is particularly the case when the specimens are immersed in the ocean so that an accumulation of marine growths can introduce a barrier to the diffusion of oxygen which is the same for all the irons.

TABLE 2.—*Tests in 3½ per cent. Sodium-chloride Solution Saturated with Air at 30 deg. C.*

Material.*	Corrosion rates.	
	M.D.D.†	I.P.Y.‡
S.-g. iron, Ni 1.5 per cent. (as cast with pearlitic matrix)	145	0.029
S.-g. iron, Ni 1.5 per cent (annealed with ferritic matrix)	155	0.031
Grey cast iron, Ni 1.5 per cent. (as cast with pearlitic matrix)	135	0.027
Grey cast iron, Ni 1.5 per cent. (annealed with ferritic matrix)	130	0.026
Unalloyed grey cast iron (as cast with pearlitic matrix)	180	0.036
Unalloyed Grey cast iron (annealed with ferritic matrix)	140	0.028

* Specimens moved at 16 ft. per min. for 7 days.
†‡ See Table 1.

Specimens immersed in the sea at Harbour Island, N.C., for three years showed that both s.-g. iron containing 1.5 per cent. nickel, and grey iron were corroded at the same rate as measured by weight losses equivalent to penetration at a rate of about 0.01 ipy. However, the alloyed s.-g. iron was pitted less to a maximum depth of 0.033 in. in three years as compared with a depth three times as great, 0.097 in., for the grey iron. As noted previously, cast-iron pipe even after corrosion in sea water may be capable of performing satisfactorily because of the beneficial properties of the graphitic residue.

Resistance to Erosion

When exposure to sea water, and presumably other neutral or alkaline solutions, involves effects of velocity or turbulence sufficient to interfere with the adherence of corrosion products, substantial differences in the behaviour of different irons may be observed. Specimens of s.-g. iron, as cast, with a pearlitic matrix resisted attack much better than the same iron annealed to achieve a ferritic matrix. Tests in water using a magnetostriction vibration device for achieving cavitation on the surfaces of the specimens showed that in a six-hour test, the cavitation damage suffered by annealed s.-g. iron with a ferritic matrix and Brinell hardness of 162 was almost five times greater than that suffered by the same iron with a pearlitic matrix and a Brinell hardness of 255. Further heat-treatment of this iron to achieve a hardness of 356 achieved only a relatively modest improvement (50 per cent.) in resistance to cavitation erosion.

Atmospheric Corrosion

Recently-acquired data have supported many practical observations of the superiority of cast irons over ordinary steels in resisting atmospheric corrosion. This advantage is most evident and most useful in atmospheres such as near the sea coast. Cast irons compare favourably with the alloy steel and are greatly superior to mild steel and copper steel in resisting attack by this very aggressive salt atmosphere. This good resistance to sea spray is, no doubt, an important factor in the successful use of s.-g. iron as an improvement over steel in applications aboard tankers and other ocean-going vessels.

Underground Corrosion

Based on the long record of successful use of cast iron underground, especially in the form of pipe, there has been no hesitation in utilizing s.-g. iron for use in such environments. Some data have been secured from tests on specimens buried in a clay soil at a depth of 3 ft. for 3 years at two beaches in Europe. The beaches were completely submerged at high tide so that the exposure must be considered as being abnormally corrosive as compared with most soil conditions. In these tests, s.-g. iron resisted attack to about the same extent as grey cast iron, as shown by the data in Table 3.

TABLE 3.—*Results of Burial of Irons in Beach Soils.*

Test location.	Penetration by corrosion in I.P.Y.*	
	S.-g. iron.	Grey cast iron.
Le Touquet	0.047	0.069
Mont St. Michel	0.045	0.043

* See Table 1.

Use on Tankers

Difficulties with corrosion of steel, especially in the form of filling and discharge piping on deck and for heating coils in tank compartments have been responsible for a very considerable use of ductile iron pipe and valves in tankers. The most acute corrosion of steel has been encountered in tankers handling crudes from the Middle East. This attack is characterized by being in the form of very large and deep pits which develop principally on upward-facing horizontal surfaces, *e.g.*, the upper third of the circumference of a horizontal pipe or coil. The exact mechanism of the pitting is not known.

Some of the early installations of s.-g. iron loading pipes in French tankers developed shallow pits early in their life. Although this pitting subsequently subsided without serious damage, its occurrence led to trials of s.-g. iron pipe containing 1.5 per cent. nickel. This nickel alloyed s.-g. iron exhibited even better resistance to pitting and other forms of corrosion. The mechanism of the beneficial effect of nickel is not yet clear. Experience confirmed by comparative tests in tankers in Europe has shown that nickel alloyed s.-g. iron-heating coils and loading pipes were superior to unalloyed s.-g. iron with respect to resistance to pitting. This has led to a preference in Europe for

Corrosion-resistance of S.-g. Iron

the alloyed iron for this service. Elsewhere the unalloyed iron is being applied for the same purposes. The relative merits of the two types of s.-g. iron will become more clearly established by more experience.

Conclusion

S.-g. iron can be considered as having satisfactory corrosion-resisting properties which will permit its use as a substitute for grey iron, malleable iron or steel where these are regularly used. In some instances it demonstrates a useful superiority in corrosion-resistance over one or other of these materials to an extent that will become more precise as this promising youngster in the metal field comes of age.

Glasgow Ironworks stops Production

Blast-furnace operations at Dixon's Ironworks, Limited, Glasgow, are shortly to be suspended for an indefinite period because of a slackening demand for steel. The ironworks, which are in the Colvilles group of companies, are one of the oldest establishments of their kind in the West of Scotland. The closure will mean redundancy for about 300 workers.

A spokesman of Colvilles, Limited, has stated that "Owing to the reduced demand for pig-iron consequent on the fall in demand for steel, arrangements are being made to suspend pig-iron production at the Govan ironworks of Dixon's Ironworks, Limited, in two or three weeks' time. The coke ovens will continue in operation and some 200 men will still be employed at the works. No date of restart for the blast furnaces can be given as this is entirely dependent on steel demand."

The works were originally established in 1839 and have been popularly known as "Dixon's Blazes" because of the vivid glow lighting up the sky at night when charging took place.

Working Days Lost in April

Industrial disputes accounted for nearly 34,500 workers losing time during April. This meant a loss of about 182,000 working days. The number of stoppages begun in April was 211, and 25 started before the beginning of the month were still in progress.

There were 169 stoppages in progress in coal mining during April. They involved 15,100 men and the loss of 25,000 working days. No other single industry had more than 10 stoppages, but 108,000 working days were lost in shipbuilding and ship repairing. In the first four months of the year 594,000 working days have been lost compared with 6,772,000 in the same period last year.

The index for wage rates stood at 113 on April 30, the figure for all industries and services being the same as that for manufacturing industries only. The same figure applied for February and March. The index was 112 in January.

A PUBLIC SUBSCRIPTION is to be launched for £500,000 to build in the centre of Liverpool one of the world's finest science libraries.

Mechanical Stokers in Smoke-control Areas

A memorandum sent to the Minister of Power, Lord Mills, by the Coal Utilization Council, invites the Minister to represent to the Minister of Housing and Local Government the desirability of giving a general exemption, under Section II, Sub-section 4, of the Clean Air Act, to furnaces fired by mechanical stokers in smoke-control areas.

Pointing out that an exemption has already been granted for oil-fired boilers, provided that they are so installed, maintained, and operated as to minimize the emission of smoke, the Council submits that mechanically-fired boilers using coal should be granted a similar exemption, subject to a similar safeguard. Such an exemption, says the Council, would permit small coal to be burnt efficiently, with the same degree of smokelessness as oil, and ensure that maximum use continues to be made of indigenous, as opposed to imported, fuel. It would also serve to minimize sulphur emission, since in general the sulphur content of industrial coals is less than that of imported fuel oils.

Although the Act permits local authorities to grant exemptions—and a number have already done so—a Ministerial exemption would secure uniformity of action over the whole country, and property owners and architects contemplating the use of mechanical stokers would not need to become familiar with different requirements of different authorities.

Scottish Laboratory Expansion

Plans for the rapid expansion of the mechanical engineering research laboratory at East Kilbride, have been put before the Council for Scientific and Industrial Research for consideration. Sir Andrew McCance, chairman of the Mechanical Engineering Research Board, writing in the Laboratory's annual report for 1957, says the board is convinced "that the nation would profit from a rapid expansion of the laboratory, and this we have proposed in a research programme for 1959-64 drawn up with the assistance of our seven committees. Excluding building and facilities provided by other ministries, this would involve expenditure at the rate of about £1,500,000 a year at the end of the five-year period."

The Board says that the scale on which the research of the various divisions of a laboratory was being carried out depended to some extent on the state of development when the work was transferred from the National Physical Laboratory. "In the decade since the laboratory was founded, spectacular industrial developments, some of them in new fields, have underlined the need for intensive research on a much larger scale if Britain is to keep her place in the world. In future certain problems on the programme of the laboratory should be attacked by larger teams."

FIRST STEP in the process of reorganization of the Hunslet engineering business is the formation of Hunslet (Holdings), Limited, as a private company with an initial capital of £100 in 5s. shares. The company will acquire all the shares of the Hunslet Engine Company, Limited, Hattersley Pickard & Company, Limited, Scootacars, Limited, and Hunslet Precision Engineering, Limited (the latter only just formed). The group will carry on the business of locomotive manufacturers, mechanical and precision engineers, and motor-car and motor-cycle manufacturers.

Equipment & Supplies

Constant-pressure Moisture Meter

Shaw Moisture Meters, 31, Market Street, Bradford, have introduced a constant-pressure type moisture meter which is claimed to be a significant advance on previous methods. By placing the sample under considerable pressure, good reproducibility of readings is obtained (0.02 per cent. moisture content in the case of dry starch for instance). The reading itself is obtained by passing high radio frequences of over 100 megacycles through the sample. The moisture is indicated on a 5-in. meter dial and there are readings from complete dryness to 100 per cent. water. The readings can be determined to one part in 1,400. The more dry the test sample the higher is the accuracy obtainable—so much so, that the accuracy of the moisture meter can, it is claimed, exceed that of the most careful laboratory tests. Unskilled workers can easily use the meter, which is simple and robust.

Mobile Infra-red Projector Unit

Metropolitan-Vickers Electrical Company, Limited, of Trafford Park, Manchester, are marketing a mobile infra-red projector unit. This is particularly suitable for localized drying in many foundry applications, *e.g.*, mould patch and blacking drying, and for stoving core or mould wash or accelerating paint drying on castings. The unit, it is stated, should not be used for drying low flash-point finishes without taking suitable precautions, and all such applications should be discussed with the manufacturers.

FIG. 1.—*The "Metrovick" mobile infra-red projector unit.*

Consisting of a standard "Metrovick" projector with tubular sheathed elements, the unit is mounted on a robust tripod fitted with rubber-tyred swivelling castors (Fig. 1). The method of construction of the tubular sheathed element and the projector unit makes this equipment particularly robust, it is claimed, and enables it to withstand the arduous conditions often experienced in service. While other sizes of projector are available, the equipment has been designed for the 24 in. unit rated 2 to 2.7 kw at standard single-phase voltages.

A POLYETHYLENE-LINED RUBBER HOSE for the conveyance of concentrated mineral acids has been developed by Dunlop, St. James's Street, London, under the trade name of "Valithene." Sizes in which the hose is available range from ¼-in. to 3-in. bore, and lengths of up to 60 ft. can be supplied. Working temperatures should in general not exceed 60 deg. C., although very low pressure steam may be used for cleansing, provided that the other end of the hose is open to the atmosphere. Maximum working pressure is 50 lb. per sq. in. Enquiries should be addressed to the Dunlop Hose Division, Team Valley Trading Estate, Gateshead.

FIG. 2.—*"Dustmaster" sack-tipping unit designed and patented by Dallow Lambert and Company, Limited.*

Dust Elimination from Sack Emptying

Dallow Lambert & Company, Limited, Thurmaston, Leicester, have designed and patented a "Dustmaster" sack-tipping unit—as a means of combating the dust nuisance. External ducting, special hoods, secondary dust problems, etc., are eliminated, and replaced by an efficient dust-control unit. Dust hazards and break-downs caused by dust penetration into the moving parts of machines can, it is claimed, be alleviated, thus aiding production. Wherever sacks are emptied of their contents (coal dust, blacking. and other materials) the unit can be advantageously applied and the dust satisfactorily controlled. As will be observed from Fig. 2, the unit is designed for easy positioning over hoppers, conveyors, storage silos, or wherever it is required.

Wheel-flange Lubricating Rod

Morgan Crucible Company, Limited, Battersea Church Road, London, S.W.11, announce that they have developed a new method for lubricating the wheel flanges of both trains and travelling cranes, utilizing a graphite lubricating rod—the Morganite wheel flange lubricating rod. This rod consists of a soft graphite material encased in a harder carbon tube. The lubricant is applied only to the wheel flanges and as it is a "solid," it cannot run or "creep" on to the tread and cause skidding. Graphite adheres well to metal surfaces; rain and dirt or heat cannot effect it.

GENERAL ELECTRIC COMPANY, LIMITED, Magnet House, Kingsway, London, announce a new range of small induction motors from 1/40 h.p. to 1/10 h.p. and continuously rated to B.S. 170/1939. Rolled steel shells with pressed-in wound stator cores form the motor bodies, with aluminium pressure-cast bearing brackets spigoted into each end. Sleeve bearings, diamond-bored true with the bracket spigot, are fitted as standard and oil-saturated felts provide efficient lubrication for prolonged running without re-oiling.

"The Standards Engineer"

The conviction that the standards engineer would ultimately emerge as a key figure in industry was apparent throughout the fourth conference, held last month at the Connaught Rooms, London, of engineers and others concerned with the application of standards techniques. A record attendance of 230 delegates went through a programme of papers and discussion under the chairmanship of Mr. H. Stafford, standards engineer of the United Steel Companies, Limited. The growing interest throughout industry in the application of standards was further reflected in the presence for the first time of members of the technical Press.

In an opening speech, Mr. F. J. Erroll, Parliamentary Secretary to the Board of Trade, established the keynote of the occasion by defining standards engineers as "the people who put standards to the test and make them effective in influencing the economy." He indicated the strength of Government support for standards, and added: "It is essential to the national economy that they should be *used* effectively, particularly when they are international standards."

Papers Presented

A report by the joint organizing committee of the British Standards Institution and the Insitution of Production Engineers, was then presented which dealt with the progress made in the past year in the promotion of knowledge and application in industry of the "three S's"—standardization, simplification and specialization—and revealed that BSI is to produce a booklet describing the preparation and status of British Standards and how far they conform with international standards.

Other papers presented at the conference included one by Sir Stanley Rawson, vice-chairman of John Brown & Company, Limited, who stressed the need for British industry to take more part in the drafting of international standards. He said that "It is not always realized that in failing to influence international standards work now we may be setting up a barrier to our exports in the future." Mr. H. G. Conway, a joint managing director of Short Brothers & Harland, Limited, assessed the pros and cons of the metric system and suggested the way in which British industry could change over to it if required. His opinion that there was "an atmosphere of inevitability about adopting the metric system," was by no means unanimously accepted by other speakers who followed although one or two maintained that a uniform world system was required and it did not necessarily matter which was chosen.

Mr. A. Parrish, standards engineer of I.C.I., Limited, gave an interesting paper in which he discussed the problem of finding makers prepared to supply their products in types which conform to British Standards. Both Mr. Parrish and other speakers pointed out in this context the advantages of BSI's certification mark, saying that it eliminated a good deal of duplicate costing, with advantages to the national economy as a whole.

The final session of the conference came back again to the opening theme—namely, the role of the standards engineer. Mr. R. B. Armstrong, who runs the standardization division of Marconi's Wireless Telegraph Company, said that the job of a standards engineer was quite simply to ensure that the principles of standardization were applied so as to improve economic productivity. To achieve this end, a standards department should be concerned with all stages from the purchase of raw materials to the marketing and possible maintenance of end-products.

The conference was unanimous in agreeing that the standards engineer's job was a full time one, and that in the comparatively small firm it should rank high enough to absorb the interest of, possibly, the "top man." Subsequent discussion re-emphasized the urgent need for and importance of better training on standards matters, and showed some support for establishing in this country a body similar to the Standards Engineers' Society in the United States, which itself might prove a valuable medium for education.

Films Always One-off Jobs

Some of the uncertainties and difficulties of producing and launching a film were outlined by Mr. W. McQuitty, a senior producer of the J. Arthur Rank Organization, when he spoke to the Non-Ferrous Club at the Queen's Hotel last week. He referred in particular to the new film "A Night to Remember," which deals with the Titanic disaster in 1912, and to illustrate his points he mentioned that at that time a first-class passage across the Atlantic cost £875, yet every cabin aboard the Titanic was occupied. He spoke also about the inadequacy of the lifeboat and life-jacket equipment, and dealt with the difficulty of reproducing some of these conditions for the purposes of making the film. Not least, he said, was the problem of finding a ship—even the shipbreakers would not sell him a scrap vessel and allow him to sink it. When he started producing a film he had ten different Trades Unions to deal with, a fact which involved quite a number of problems. Every film, he said, was a prototype—it was not like casting ingots—and no one knew until the public response had been estimated whether the film would make money or not.

At this luncheon a collection was taken on behalf of the Empire Society for the Blind, the sum realized being £15 1s.

Employment Prospects in Wales

At a luncheon given by the Industrial Association of Wales and Monmouthshire, in Cardiff, last week, Mr. Richard Wood, Parliamentary Secretary to the Minister of Labour and National Service, speaking of the set-back which industry is experiencing in Wales said that the Government was endeavouring to persuade new industry to come to the needy areas of Wales. The list of potential projects included the "M" scheme of the Steel Company of Wales, at Margam, the British Petroleum Company's oil terminal at Milford Haven, and certain other works which would need more labour this year. In North Wales, schemes included a few new factories, and an important development making steel tubes at Shotton, near Chester.

New powers to finance sound projects were being sought in Parliament, and, in April, improvements under the Resettlement Transfer Scheme had been announced. He concluded by saying that "Whatever the Government do, it needs the support of the Welsh people themselves to persuade industrialists of the greatest attraction of Wales—its good supply of adaptable labour. Wales should blow its own trumpet!"

Latest Foundry Statistics

Light-alloy Castings: The output of aluminium castings during March, as reported by the Ministry of Supply, was 1,739 tons from sand moulds, 3,865 tons was gravity-die, and 1,587 tons was pressure die-castings. Castings produced from magnesium and its alloys amounted to 153 tons.

Wear-resistance of Some Nickel-base Alloys

*By R. A. Kozlik**

In what follows details are given of a test programme which was undertaken to determine the relative resistance to wear and galling of a variety of wrought and cast nickel-base alloys. The abstract has been made with a view to concentrating on those tests which dealt with the cast, rather than the wrought material. The author points out in this connection that it has been possible through alloying, to develop cast versions of the three major nickel-base alloy types which show distinct improvements in wear and galling resistance.

The usefulness of many nickel-base alloys lies in their resistance to corrosive environments over a wide range of temperature. Situations often exist where resistance to wear and galling, or seizure, is desirable. The Amsler wear tester used in the research under consideration was set so that one shaft turned at 440 r.p.m. while the other turned in the same direction at 400 r.p.m. so that the test discs were operated under conditions of 110 per cent. slip at the wearing surfaces, equivalent to a speed of travel of about 512 ft. per minute. The lubricant used was a light turbine oil having a viscosity of 305 Saybolt seconds at 100 deg. F. and 50.8 Saybolt seconds at 210 deg. F. The desired function of the oil was to act as a coolant to wash away products of wear and to serve as a mild lubricant. The tests were designed to provide some practical information about the behaviour of nickel-base alloys when mated against themselves or other alloys.

All three of the basic wrought nickel alloys, "A" Nickel, Monel nickel-copper alloy, and Inconel nickel-chromium alloy, galled readily when self-mated. The low resistance of these three alloys to galling is one reason why they are not usually mated with themselves unless bearing pressures are low and lubrication adequate. The same tendency for ready galling has been observed for many of the austenitic types of stainless steel.

Cast Alloys

It has been possible, through alloying, to develop cast versions of the three major nickel-base alloy types having much greater resistances to wear and galling. "G" Nickel anti-galling cast nickel and "S" nickel, a hard-grade cast nickel, are nickel alloyed with carbon and silicon respectively. Cast "H" Monel semi-hard nickel-copper alloy, "S" Monel hard nickel-copper cast alloy and "S" Inconel hard-grade nickel-chromium cast alloy owe their improved wearing properties to their being alloyed with silicon. The success of most of the cast high-nickel alloys that have been developed for use in applications where it is essential to reduce wear and galling to a minimum, depends on the presence of microstructural constituents that are soft and that have good lubricating qualities, or that are very hard. Alloys containing free graphite, or elements such as lead or bismuth fall into the first category, while those containing carbides, borides or silicides fall into the second group. Alloys of both types have different, although overlapping, areas of maximum usefulness. "G" Nickel, a cast nickel mated with itself, benefits from the presence of graphitic carbon when lubricated. The alloy is also found to be useful without lubrication if the bearing pressures were less than 0.89-1.33 tons per sq. in.

The addition of 5.5 to 6.5 per cent. silicon to cast nickel results in the formation of free silicides in the structure, which eliminate wear and galling at bearing pressures as high as 14.9 tons per sq. in. when lubricated. There is no tendency for "S" Nickel alloy to gall at higher bearing pressures even though some wear may occur. The two cast nickel-copper alloys, "H" Monel alloy and "S" Monel alloy, also owe their improved wearing qualities to the presence of hard silicides. The nominal 3.2 per cent. silicon present in the former results in an alloy possessing a higher level of gall or wear resistance than regular cast Monel. "S" Monel, containing nominally 4 per cent. silicon, is even stronger and more wear resistant, but has a lower level of ductility.

Cast Inconel may be used to resist oxidation at elevated temperatures and in oxidizing acids and oxidizing acid salts, where Monel alloy is of limited value. Silicon and carbon additions are helpful if the service conditions, with respect to wear, are more severe. A 3.5 per cent. silicon addition produces a marked improvement, and better results are obtained with a 5.5 per cent. silicon. The "S" Inconel alloy, containing 5.5 per cent. silicon, is capable of operating at stresses as high as 22.7 tons per sq. in. without difficulty.

One of these corrosion-resistant hard surfacing alloys was included in the test programme, Colmonoy 6. The presence of borides, carbides and silicides in the nickel-chromium-iron matrix apparently was responsible for the very low wear rate observed at all bearing pressures surveyed. This alloy, and other similar hard surfacing alloys, could be expected to be quite suitable for meeting

* The author is research metallurgist to the International Nickel Company, Bayonne, New Jersey. The original paper was entitled "Wear and Frictional Characteristics of Some Nickel-base Alloys Tested at Room Temperature."

severe service requirements when hard surfacing methods can be applied.

Most of the wrought nickel alloys do not have outstanding anti-wear properties if mated with themselves. The work was then extended to include dissimilar alloy combinations. Duranickel, a wrought alloy mated with either cast "S" Nickel alloy or cast "G" Nickel alloy, performs well. If bearing stresses below 8.25 tons per sq. in. are to be encountered, "G" Nickel alloy might be preferable because of its superior machinability. At higher stresses, or where lubrication may be intermittent or absent, the use of "S" Nickel alloy would be preferable. It is probable that neither alloy could be mated with "A" Nickel satisfactorily. "S" Inconel alloy was found to be a good alloy mate for wrought Inconel "X" alloy. Its performance with wrought Inconel alloy was such as to indicate an improvement over self-mated Inconel alloy, but service requirements would necessarily need to be moderate with bearing stresses lower than 9 tons per sq. in. and with lubrication provided. Galling was so severe when "S" Inconel alloy and 17-7 PH stainless steel were tested, that it is doubtful that such a combination could be successful except under the mildest of operating conditions.

Mating Cast and Wrought Alloys

The combination of cast "S" Monel alloy with wrought "K" Monel alloy results in a lower wear rate than for "K" Monel alloy mated with itself. Best results could be expected at bearing pressures below 9 tons per sq. in. with lubrication.

Alloys whose resistance to wear depends on the presence of hard particles in the structure may not always be successfully used in contact with alloys of poorer wear resistance. Hardness is not a criterion of expected behaviour since 17-7 PH stainless, with a Brinell hardness of 436, consistently galled more readily and wore more rapidly than either wrought Inconel alloy, Brinell hardness 262 or Inconel "S" alloy, Brinell hardness 340 in contact with "S" Inconel alloy.

Soft alloys such as "A" Nickel, Monel alloy or stainless steel derive little benefit from being mated with alloys containing hard microconstituents. However, the age-hardenable high-nickel alloys show a substantial improvement.

Bearing Alloys

Most of the bearing alloys consist of a matrix of some type containing phases rich in lead, tin or bismuth which promote the formation of low shear strength, high ductility films on the contact surfaces and which minimize galling tendencies. At successively higher bearing loads rapid deterioration could be expected at pressures above their yield strength under compression. This factor of low compression-yield strength must be considered.

It is not the intention to evaluate a wide variety of bearing alloys here, but rather to show that suitable bearing alloys can be used with nickel-base alloys with considerable success. Several of the wrought nickel alloys were tested against a leaded copper-tin bearing bronze. The results obtained for Monel alloy were typical of those obtained for "A" Nickel and Inconel. When lubricated, neither the bronze nor the nickel alloy mate showed any tendency to gall or wear. When bearing pressure was raised above the compressive-yield strength of the bronze most of the wear was confined to the bronze. The bronze wore rapidly at 7.8 tons per sq. in. without lubrication but no damage was done to the nickel alloy. This type of performance is highly desirable when intermittent lubrication is anticipated.

Occasionally bearing alloys are required that have better corrosion resistance than leaded bronze. The Waukesha alloys 23, 50 and 88 fall into this category. Since the strength properties are substantially higher than those of the leaded bronzes it is probable that their range of usefulness extends far beyond the bearing alloy classification that they have been given here. It was found possible to reduce the wear rate of "A" Nickel to a very low value, and to eliminate galling by mating with the Waukesha 23 or 50 alloys, when lubricated. The Waukesha 88 alloy has recently superseded the number 50 alloy. Tests made with the 88 alloy mated with various types of austenitic stainless steel have shown it to be an improvement over the 50 alloy. The benefits of lower filming tendencies and increased maximum usable bearing pressures will probably be shown to extend to the high-nickel alloys also, by subsequent tests.

Protective Coatings

Some attention was focussed on the wear characteristics of several protective coatings. The success or failure of surface coatings in making it possible for an alloy to be used when resistance to wear and galling is required, depends on the nature of both the coating and the application. Obviously the coating must overcome any galling tendencies of the basis alloy and it must be adherent enough to remain on the metal surface during use. In addition, the benefits of the coating may be expected only as long as it remains intact. This means that coatings are generally of limited use for moving parts unless these coatings are resistant to wear or unless they can be replaced as they wear away. Unless very thin coatings can be used, it may be necessary to make the necessary dimensional allowances.

Frequently the coatings do wear away and cannot be replaced while the parts are in motion. Under such conditions the use of coatings to prevent galling cannot be considered wholly satisfactory. In situations where only limited and infrequent movement is involved, coatings may be highly desirable. Even in limited motion service it may not always be possible to use coatings. Nickel-base alloys and the stainless steels are often used primarily for their corrosion resistance. Unless the coating also resists corrosion or high-temperature oxidation, it will soon deteriorate and become worthless.

Institute of British Foundrymen

Proceedings at the Annual Conference in Buxton

(*Continued from page 670*)

This first-hand report of conference week of the IBF in Buxton is continued by a brief resumé of the Edward Williams' lecture, and a summary of the later events and features of the week's programme. (Extracts from the technical papers—and discussions will be printed shortly).

After the presidential address (reported previously), for which the vote of thanks—proposed by Mr. J. Blakiston, M.I.MECH.E., seconded by Mr. E. Longden—was warmly accorded, the proceedings of the Institute of British Foundrymen in conference at Buxton continued with the Edward Williams' lecture. Mr. A. E. Peace, the new president, took the Chair for this part of the session.

The president first introduced to the meeting Professor A. J. Murphy, M.SC., F.I.M., F.R.AE.S., principal of the College of Aeronautics, Cranfield, who had been chosen to deliver this year's Edward Williams' lecture. He mentioned Professor Murphy's early foundry associations (he is a past-president of the IBF London branch), his subsequent development of the Department of Applied Metallurgy at Birmingham University and commented on the responsibilities of his present position at the College of Aeronautics.

"Metallurgy and Aeronautical Progress"

Professor Murphy then delivered his lecture, for which he had chosen the title "Metallurgy and Aeronautical Progress." He used this theme to show how advances in aeronautical structural engineering had shown the need for properties in metals not demanded in the past and how some metallurgical rationalization had been applied to these considerations.

Quoting steps in the progress of the application of metals to aircraft design, the lecturer first instanced the tensile strength: density ratio as being of major importance, as witnessed by alloys such as Duralumin and artificially age-hardened versions of this alloy. Next came Al/Mg/Zn alloys suitably heat-treated, but early exploitation of these had shown their susceptibility to stress-corrosion cracking and development had been delayed until the late 'thirties when Devereaux had made an acceptable family of alloys of the RR 77 (DTD 363) type. These gave a 0.1 per cent. proof stress of not less than 33 tons per sq. in., not less than 38 tons in tensile and 5 per cent. elongation, reflecting an improvement of about 30 per cent. in strength/weight ratio over the strongest of the Duralumin group. In the US a similar alloy 75 S was brought into use at the end of 1943 and UK modifications were made to the sheet and forging alloys of the same type.

Fatigue Considerations

This really was the limit of development of this class of alloys, which gave good service in aircraft having up to a few hundred hours of flying life, and the suitability of which could be assessed by the usual physical tests of the time. After the end of the second world war, Professor Murphy went on to say, fatigue of metals used for aircraft construction had become increasingly a serious problem. Three reasons for this were (*a*) the increasing number of flying hours expected from aircraft (*b*) higher cruising speeds and (*c*) the development of the latest high-strength alloys was not matched by increased fatigue resistance. Here the professor exhibited a chart summarizing fatigue loads on aircraft grouped according to frequency of occurrence and reported the vulnerability of joints of wing spars and the like and (later) the superimposed stresses on the fuselage (*c.f.*, the Comets) due to pressurization.

It was clear, then, that a new conception of test requirements was necessary and the lecturer went on to give an indication of this by quoting that an "ultimate design load" could be arrived at by multiplying by 1.5 the load imposed on a structure when a plane flying at its normal cruising speed encountered a gust of wind of 50 ft. per sec. To take account of fatigue, he said the requirements of the alloy were such as were represented by its withstanding the superimposition of $\pm 7\frac{1}{2}$ per cent. of the ultimate design load for two-million cycles.

It followed that an aircraft joint designed on the basis of static mechanical properties in 1935 would suffer an eightfold decrease in potential life if constructed to the same factors of static strength in present-day high-strength alloys. This was because fatigue resistance had not kept in step with tensile improvement.

Two Problems

From consideration of these matters two problems had emerged (*a*) for the designer as to when to cater for fatigue as a major stress and (*b*) for the metallurgist as to what could be done to provide fatigue resistance in metal plus adequate general physical properties (in addition to stress concentration due to "notch sensitivity").

In connection with the latter, Al/Zn/Mg alloys had proved to be quite notch sensitive—it appeared that some plastic deformation (of microscopic proportion) occurred at the point of stress, where an "over-aged" structural condition of the metal was precipitated by mechanical movement. The metallurgist's job was to combat this tendency.

The lecturer then showed the relative nature of fatigue loads on various aircraft stressed members —spars, wings, fuselage, etc., and mentioned the

margins of security required from constructional materials.

Speed of Crack Propagation

The next important factor, Professor Murphy said, was the speed of propagation of a stress-raising crack. Much research on this aspect is still continuing, to define the critical crack length for a standard test specimen of a given material. It appeared that this much depended on the nature of the material itself. For example, under this criterion, naturally-aged Duralumin behaved better than the same alloy artificially aged and the fully-heat-treated Al/Zn/Mg alloys were still more seriously affected by notches. Indeed wide differences were shown by different materials in their reactions to notched/fatigue stresses—changes usually being inverse to tensile strength for a number of alloys quoted. It was necessary, however, to bear in mind that the applicability of a metal under these circumstances depended to some extent on whether the stresses were compression or tension at a given point.

In support of his views at each stage of the preceding discourse, Prof. Murphy reported facts and figures for loads and stresses in particular aircraft structural locations and quoted from the work of several research workers in the same field. Concluding, he voiced the opinion that although metallurgists were on less-firm ground now that new factors of stress had become apparent in post-war years, they had gone a considerable way in developing materials to meet the new demands. Moreover, the situation was not without its compensations for the demands of aircraft metallurgy had shown up some "dark spots" in the understanding of the true nature of the fatigue process and the propagation of cracks in an important class of engineering materials. There seems to be good prospect, he said, that the new conceptions of "crystal imperfections," "dislocations" and "lattice vacancies" might throw much-needed light on theoretical metallurgy and lead soon to valuable advances in practice.

Following normal procedure, the lecture was not discussed and the session terminated on the accordance of a vote of thanks to Prof. Murphy, proposed by Dr. A. B. Everest, seconded by Mr. C. H. Wilson.

Presentation to Mrs. Blakiston

Members were joined by the ladies at luncheon on Wednesday in the Pavilion Gardens, Buxton, the East Midlands branch of the Institute being hosts on that occasion. At this function, the president (Mr. A. E. Peace) presented the retiring president's wife (Mrs. Blakiston) with a set of silver hors-d'œuvres cutlery as a memento of her year of activity as the president's lady. (Normally, this presentation is made by the Institute's treasurer, Mr. N. P. Newman, J.P., but Mr Peace deputized owing to Mr. Newman's absence abroad.)

Subsequent Proceedings

For the menfolk attending the conference, Wednesday afternoon and all day on Thursday were spent in technical sessions, while their ladies attended first a beauty culture demonstration (Wednesday afternoon) and all-day coach trips to Kedleston Hall, Hardwick Hall or Haddon Hall (on the Thursday).

On Wednesday evening, there was a formal reception by the president and Mrs. Peace, followed by the Institute's annual banquet and dancing (already briefly reported in the JOURNAL). At this function, all the ladies were presented with a pottery flower bowl as a souvenir of the conference.

On the Thursday evening, for those members and ladies who were so inclined, there was arranged an informal programme of light orchestral music, dancing and cabaret in the Pavilion, followed by a performance of "*Son et Lumiere,*" a pageant representing the story of Buxton. This latter was held on the slopes facing The Crescent, Buxton and the East Midlands branch of the IBF were again the hosts.

Friday Proceedings

Following time-honoured custom, all day on Friday, May 16, was devoted by the male conference contingent in visiting neighbouring works,* journeys were made by motor-coach by six major parties. In this manner the premises of Stanton Ironworks Company, Limited, at Melton Mowbray, in the morning, and S. Russell & Sons Limited, Leicester, in the afternoon were visited by party (*a*); Jackson Bros. (Milton), Limited, Stoke-on-Trent (a.m), and Bamfords, Limited, Uttoxeter (p.m.), by party (*b*); Stanton Ironworks Company, Limited, Nottingham (all day) by party (*c*); British Railways' Foundries (a.m.) and Ley's Malleable Castings Company, Limited (p.m.) (both at Derby), by party (*d*); International Combustion, Limited (Derby) (a.m.) and Parker Foundry (1929), Limited (Derby) (p.m.) by party (*e*) and Butterley Company, Limited, Ripley (a.m.) and Sheepbridge Alloy Castings, Limited, Sutton-in-Ashfield (p.m.), by party (*f*).

During this period, the ladies either toured Dovedale and visited the Royal Crown Derby Porcelain Company, Limited, or British Celanese, Limited (parties (1) and (2)), toured the Peak District, followed by a visit to Remploy, Limited (party (3) or toured South Cheshire and North Staffs and visited Josiah Wedgwood & Sons, Limited (party (4)).

To wind up the conference proceedings, an informal dinner/dance in the Pavilion Gardens, Buxton, was held on the Friday evening. At this function Mr. A. E. Peace and Mrs. Peace presided, but there were no formal speeches and members and ladies circulated freely among each others tables; music during dinner and dancing was provided by Jim Armstrong and his Pavilion Orchestra.

* All works visited were described briefly in the JOURNAL, April 10 and 17 issues.

Electric-arc Furnace for South Africa

A practical tribute was paid to British design and craftsmanship last August when the South African Iron and Steel Corporation commissioned an English firm to build a 70-ton arc furnace for their Pretoria works. In what follows details are given of the construction of this plant, which is claimed to be the first of its kind in the southern hemisphere.*

Built in South Africa to a British design, a 70-ton arc furnace has recently been installed at the Pretoria Works of the South African Iron and Steel Corporation in Transvaal. It is a top-charged, direct-arc, tilting furnace, with three 18-in. dia. graphite electrodes connected to a 15,000 kva transformer. The transformer is fed from a 33 kv. supply and is fitted with "on-load" tap changing. The furnace shell has an i.d. of 18 ft. 6 in., giving a nominal capacity of about 62 tons. Tilting of the furnace is operated hydraulically and the maximum angles of tilt are 40 deg. forward and 15 deg. backwards.

On starting up, the furnace was immediately put on to a 24-hr. day, seven days a week production schedule, and in September, 1957, 6,800 tons of tonnage steel were made. The average power consumption to date is under 500 kwh. per ton and the electrode consumption, under 8 lb. per ton of steel melted.

Furnace Design

The furnace bottom is flat and supported on a robust chassis. This simple construction makes bricking of the lining easier, and will facilitate the fitting of a non-magnetic steel plate to the furnace bottom, should an induction stirrer be required at a later date.

The body itself is entirely independent and sits on the chassis. It is made of skeleton construction, enabling the body plate, side panels and base panels to have "breathing" joints to cater for expansion, thus considerably reducing the risk of body distortion. These side panels are comparatively light, tack-welded plates, the use of which has been made possible by the sturdy main framework of the furnace, and can be removed for local lining repair from outside the furnace, and while it is still hot.

The back frame supporting the electrode-raising gear and the roof-slew gear is also supported on the chassis. However, the body- and roof-slew gear are entirely independent, thus avoiding the transference of torque or stress to the furnace body; even with body distortion or roof-ring distortion there is unlikely to be any interference with roof slewing. Only the roof ring and brickwork are lifted by the system of levers when raising and slewing, thus simplifying the supporting of the cantilever load, the massive weight of the roof being carried on a pivot post and suitably mounted rollers at platform level.

The mechanical effort required for roof movement is less than that required in designs where the whole of the back structure and electrode mast have to be lifted. The gallows-arm type of electrode mast and arm is used in this unit permitting the electrical conductors to be carried well above the steelwork, improving the overall power factor and reducing heating of the steelwork by eddy currents.

Roof Changing

Roof changing is very simple. It is not necessary to remove the electrodes—merely to grip them in the holders in a lower position. Neither is it necessary to remove the electrode cooler. The attachments are released between the lever system, mentioned above and the roof ring. The roof-raising

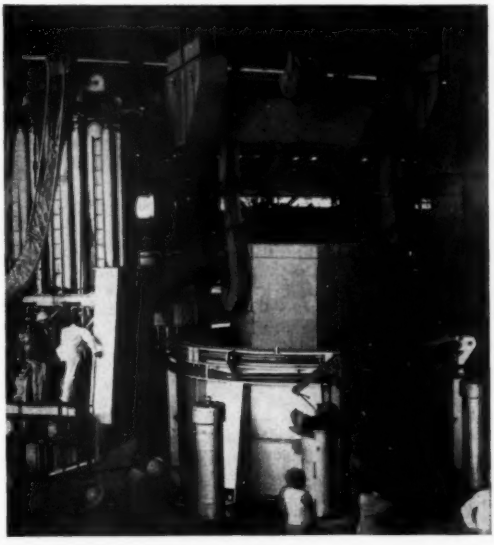


FIG. 1.—*View of the 70-ton arc furnace installed at Pretoria, showing charging in process.*

mechanism is then swung aside, carrying with it the electrode coolers but leaving the roof itself in position, on top of the body, where it can be replaced with a new one, by the shop crane. The whole operation of roof changing can be carried out in half an hour.

The electrode masts are counterbalanced by a pneumatic arrangement incorporated within the masts. The total weight of each mast, together with the electrode assembly, is about 8 tons, and this

* Electric Furnace Company, Limited of Weybridge, England.

Electric-arc Furnace for South Africa

is completely counterbalanced. By using air to counterbalance, the inertia of the moving parts is at a minimum. This system is so effective that only 3 h.p. motors are needed for raising and lowering the electrodes. The electrode regulator is of the well-known Rotodyne design, of which over 50 have been supplied since the war. To enable maximum metallurgical control to be carried out, the furnace is equipped with two doors, which are operated electrically.

The transformer is of the external water-cooled type working in conjunction with an air blast circuit breaker with a rupturing capacity of 7,500 mva. The transformer is provided with a range of tappings to give alternative furnace operating voltages, the required tapping being selected by "on-load" tap change switchgear.

GKN Chairman and Steel Renationalization

Four reasons why the steel industry should not be renationalized are listed by Mr. K. S. Peacock, chairman of Guest, Keen & Nettlefolds, Limited, in his annual report. Primarily, Mr. Peacock is convinced that control of any newly-nationalized industry would become as "remote, rigid, and frustrating" as in the existing nationalized industries.

Secondly, he says, the steel industry would become a monopoly with the companies losing their identity and individuality. Thirdly, direct exports of steel (they amounted to £213,000,000 in 1957) must suffer for the same reason, and, finally, where overseas companies are owned by British steel companies, State control from the UK would be resented in those countries where they operate.

Although the trading interests of the group lie primarily in the general engineering industry, it has over the years invested a large amount of capital in iron and steel, and to-day produces the greater part of its basic material requirements. Average annual production of the group steelworks in billets, sheet, bars, etc., in the last three years amounted to 1,300,000 tons, of which 945,000 tons was processed within the group.

The four companies of the GKN group which were previously nationalized operate as separate entities and in them GKN has invested in the equity share capital at a total cost of £16,529,323. In addition, since the acquisition of these companies, £6,679,124 has been retained out of profits and added to reserves, while further capital commitments amount to £17,920,000. Thus, the total capital outlay on the four steel subsidiaries already made and in prospect exceeds £41,000,000. The parent company also holds 2,000,000 £1 shares in the Steel Company of Wales, Limited.

Although the early months of 1958 have produced satisfactory results for the group, some companies are drawing on their order-books with the rate of ordering generally on the decline, Mr. Peacock states. In the year ended December 28, 1957, there was a net profit of £10,199,747, compared with £9,556,539. The dividend on a larger capital is raised 1½ per cent. to 15 per cent.

THE GENERAL CHEMICAL DIVISION of Imperial Chemical Industries, Limited, is to allow £3,000,000 for further development of the Cassel Works, Billingham.

Statuary in Fountain House

Fountain House in Fenchurch Street, 13 storeys high above ground, is the tallest and most striking building erected in the City of London since the war. The shipping theme and world-wide connections of the lessees and many of their tenants is reflected in the design of the fountain (illustrated below) which plays in the innermost part of the long entrance hall. The fountain was cast at the works of the Morris Singer Company, Limited, South Lambeth, from a plaster sculpture by Miss Margaret Wrightson, F.R.B.S. It consists of an aluminium statue of a boy standing on a globe and holding aloft in his right hand an aeroplane and with a sailing ship clasped in his left hand. The impression is given that he is poised to launch the aircraft into the sky. Sea horses flank the column that holds up the globe; fish and birds look up at the boy from the perimeter of the fountain's basin, and a curtain of water falls continuously down the wall at the rear. Trani marble and a highly-polished silver-grey cellulose finish to the lift and entrance doors help to give the entrance hall of Fountain House an almost luminous effect. (Miss Wrightson was also responsible for the monument to the late Earl Jellicoe for St. Paul's Cathedral and the memorial to Charles Lamb in Temple Gardens.)

A SPECIAL COMMITTEE is to be set up to study the practicability of establishing an iron and steel industry in New Zealand, it was stated in Wellington on June 3 by the Prime Minister, Mr. Walter Nash.

After the Bloomery—the Furnace

It is not always realized that the first iron worked, apart from meteoric iron, was a ductile wrought iron or steely-iron hammered out from the spongy "blooms" which coagulated in the bottom of the crude furnace (the forerunner of the blast-furnace) in a form convenient for use, it was forged into bars and this process also rid the iron of its slag and cinder impurities. At first, the hammering was done by human labour but soon water power came to be used to turn mill-wheels which worked huge trip-hammers. Hence the terms "forge" and "hammer-pond" came into use, and established themselves in the local place-names of the old iron-working areas. This was the direct method of iron-making.

The indirect method of producing cast iron by first smelting it in furnaces hotter than the earlier bloom-

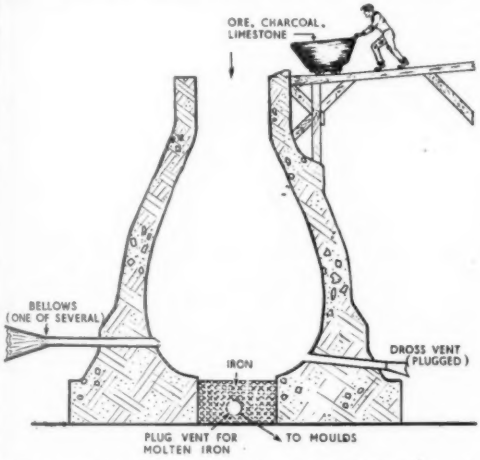


FIG. 1.—*A reconstruction of an early furnace made from rare contemporary sketches.*

eries, and converting this at a later stage into wrought iron by puddling come quite late in the story of iron making. Blast-furnaces seemed to have appeared first in France and Flanders in the 14th century and were established firmly in this country—especially in the Wealden iron area—by the reign of Henry VIII, who did much to encourage these furnaces and allowed French craftsmen to settle in England bringing their "mysterie" with them.

Reconstruction from Drawings

Although some of the earlier furnaces seemed to have been blown by hand-worked bellows of the smithy type, the existence of the hammer-ponds at the forges very soon made possible the use of the water power for working the bellows. A reconstruction of one of these early furnaces can be made from the very scarce contemporary drawings which have been preserved (Fig. 1). In a sketch made by Edward Browne when he wrote from Horsmonden in Kent to his father in 1669, it is said, "At Horsmonden . . . are ironwerkes and brasswerkes in order to the making and casting ordinance" and the writer includes a rough sketch of a blast-furnace which he had seen. A not dissimilar drawing of a furnace is shown on the brass face of the famous Ashburnham thirty-hour clock on which the details of the industrial scene at the Ashburnham iron-working area are engraved. The authenticity of this clock-face, however, has been questioned and the fact that it was formerly in the possession of Mr. Charles Dawson of Piltdown Man fame makes this suspect. Was it faked like the notorious skull? A half-tone reproduction of a photograph of the clock-face appears in Hayden's "Chats on Cottages and Farmhouse Furniture" (Ernest Benn, Limited) and it appears contemporary in general trends to the early 18th century.

Spalling of Silica Bricks

Abstract from Research Report

A paper on the "Spalling of Silica Bricks," by Mr. J. Hargreaves from the United Steel Companies, Limited, research and development department, presented to the British Ceramic Society, is introduced by the following statement:—

Recently many new and improved brands of silica brick characterized by low Al_2O_3 content and low porosity have become available. The best bricks have an Al_2O_3 content of less than 0.5 per cent. compared with less than 1 per cent. for ordinary grades, and a porosity of approximately 20 per cent. compared with up to 26 per cent. In works practice the effect, if any, of these changes on the spalling-tendency of bricks has not been obvious. Accurate information on the safe heating-rates of roof blocks is, of course, necessary when faster heating-up schedules are being used or hot repairs practised. A research programme was therefore devised to bring up to date information on safe heating-rates of silica roof-blocks and at the same time to obtain if possible an insight into the mechanism of the spalling which takes place when the critical rate is exceeded.

In his research Mr. Hargreaves reports, that by means of a hot-face spalling-test the critical heating-rates of 15 brands of silica brick have been investigated. The results indicate variations in the maximum safe heating-rate from 1 to 5 deg. C. per min. These variations are considered to be due in the main to the consequences of differences in Al_2O_3 content, the form in which the Al_2O_3 occurs and the type of rock from which the bricks are manufactured. Cracking takes place in a zone behind the hot face where the strength is lowered due to the inversion of a crystalline silica phase. In relating the results to the heating up of open-hearth furnaces, it is emphasized that the laboratory findings indicate the maximum heating-rate with no factor of safety and that due consideration must be given to other factors such as uniformity of heating, expansion allowances and heating-schedules of other parts of the furnace.

IBF Golf Meeting—Preliminary Notice

The 1958 meeting of the IBF Golfing Society will be held at the Woodhall Spa Golf Club, on September 27 and 28. All wishing to participate in this event should make their own arrangements regarding hotel bookings by writing direct to W. A. Rennie, manager, Golf Hotel, Woodhall Spa. This hotel offers first-class accommodation, and is recommended with confidence. (Non-playing IBF members and their wives are particularly welcomed at this event.)

Members of the Golfing Society should send their 5s. annual subscription to the secretary, Mr. G. W. Nicholls, c/o Modern Foundries, Limited, Albert Road, Halifax (cheques and postal orders to be made payable to Mr. Nicholls).

Book Reviews

Cost Finding in the Non-ferrous Metals Industry.

A Report by the British Non-ferrous Metals Federation, 132, Hagley Road, Birmingham, 16; price 42s.

For the first time in 20 years, industry generally is having normal competition and, as a result, the individual firm must seek to achieve greater managerial efficiency. Reasonably accurate and intelligible costing—and no costing can claim to be more than this—is essential to all businesses in the founding industry. The list of members of the Costing Committee and of the Accountants Advisory Panel which appears at the opening of this book indicates—in fact guarantees—that the subject matter has been based upon a wealth of experience and technical knowledge. Thus it is fair to say that anyone in the foundry industry will find that reference to this book is a useful means of checking his own costing system.

The book is a guide and not a description of a complete costing system. It is a guide to the ways in which the costing problems of the industry have been solved by some firms. It is moreover an extremely full guide. This method of presentation may in fact prove to be much more useful than the method of issuing a "uniform system," the practical application of which in so many cases is found to be far from uniform. This method of treatment has therefore avoided the impositions of the burdensome struggle to fit one's own methods into a framework of someone else's liking. The book is the type of guide from which one can take much or little, according to one's own convictions, the capacity of one's own staff or immediate needs. The format of the book is excellent. Short paragraphs are well titled and numbered to give conciseness and ease of reading. The brevity of statement is a markedly good feature and is in contrast with many of the tomes issued without real concern for the reader. Another valuable and unusual feature is the segregation of the examples into a separate section at the end of the book. These are so arranged that they can be opened to lie alongside the text to which they refer. It is unfortunate that the value of this excellent feature is somewhat lessened by the fact that some of the examples are laid out to be read vertically so that the book has to be turned. Nevertheless this method of treating schedules is so much better than the familiar mixing with the text that one is very grateful for it.

It is commonplace to say that a book is indispensable and in fact it is rarely true. However, it is possible to say of this book that foundries would be wise to examine their present methods very carefully in relation to the methods described in this manual.

F. SIMMONDS.

Practical Guide to the Design of Steel Castings.

Published by the British Steel Castings Research Association, East Bank Road, Sheffield 2; price 12s. 6d.

The British Steel Castings Research Association, having acquired from the French *Editions Technique des Industries de la Fonderie*, the English translation rights of their publication known as the *Guide Practique du Tracé des Pièces en Acier Moulé*, has now published this work in English, under the title—"A Practical Guide to the Design of Steel Castings."

The book deals with steel-castings design from the point of view of soundness, economy in production and good engineering principles. It is an up-to-date study of the problems of steel-castings shaping, and is well illustrated by 121 working diagrams. It is strongly recommended as an invaluable *vade mecum* for all designers, draughtsmen, engineers and others—including practical steelfounders and students—concerned with the specification, design and production of cast-steel components for all purposes.

(Copies of this book can also be obtained from the Penton Publishing Company, Limited, at 2, Caxton Street, Westminster, London, S.W.1, and at Penton Building, Cleveland, 13, Ohio, U.S.A.

The Practical Engineer's Pocket Book, 66th edition.

Published by Sir Isaac Pitman & Sons, Limited, Parker Street, Kingsway, London, W.C.2; price 12s. 6d.

This book has been kept in pocket-size dimensions, though it carries about 750 pages. It is divided into 22 sections, many of which are of interest to foundrymen, such as cranes and lifting tackle; pyrometry; metallurgy; air compressors; and industrial hygiene. There is a section carrying technical dictionaries in French, German and Spanish, and these are just sufficient to cover the most common words. In future editions, the space taken up by this section could be used to better advantages with some notes on electrical apparatus in general.

House Organs

The North Britisher. Vol. 1, No. 1. Issued by the North British Steel Foundry, Limited, Bathgate, Scotland.

A good start has been made with this issue, catering as it does for both the staff and the customers. It contains quite a few general-interest articles. There is an interesting announcement that the installation of equipment for the company's new training school is nearing completion. It would appear to cater especially for the budding mechanics. Some interesting information is given about the firm's patternshop, and in this connection it is not good publicity to publish an old picture of the department, yet as a first effort, the publication is a good one.

Legrand, Vol. 2, No. 2. Issued by Le Grand, Sutcliff and Gell, Limited, London, Southall and Rochester.

There is a certain "breeziness" about this magazine which differentiates it from most. As it is written for circulation within the company this would seem to be appropriate. Though this is the objective, there are no "sports reports," though such activities are pursued. The reproduction in the magazine of the advertisements the firm have recently used is meritorious, and it is interesting to note that the one for Western Foundries has been favourably commended upon in an American employers federation magazine.

The Forge, No. 2. Issued by the Brockhouse Group of Companies, 25, Hanover Square, London, W.1.

It was very flattering that the Editor of this publication should not only print the FOUNDRY TRADE JOURNAL review of the first issue, but also to say that he was adopting the suggestions made. Though a little depressing, the chairman's article is the epitome of commonsense, when he insists that money is a prerequisite for not only industrial expansion, but for an organization's very existence in a competitive world.

Study of Grinding-ball Wear using a Radioactive-tracer Technique

By A. L. Wesner, M. Pobereskin and J. E. Campbell

The Paper, an abstract of which is given in what follows, was originally presented before the Metals Beneficiation Division of the Mining Society of the American Society of Mechanical Engineers. It summarizes the results of an investigation in the effects which certain of the chemical and physical properties of grinding balls have on wear rate when they are employed in grinding cement. For purposes of the study, tests were made in various commercial ball-mills. The investigation shows that cast grinding balls give a creditable performance on an economic basis when compared with the forged types.

A number of grinding balls were tested with a view to assessing the influence which their chemical and physical properties had on the degree of wear-resistance. All the specimens were of 0.940 in. dia. It was recognized that the mechanism of wear was not the same in the wet mill as in the dry mill. Therefore, the conditions of balls tested in each of the two environments were not necessarily the same. Balls evaluated in the dry mill were tested simultaneously for one time period. In the wet mill, balls were tested simultaneously for three different time periods.

TABLE 1.—*Composition and Hardness of Types of Grinding Balls Tested, together with Comparative Wear Rates for Each Type.*

Type.	Typical composition and hardness.					
	Carbon.	Alloys.	Hardness, Rockwell C.	Spec. No. (SAE).	Wear rate oz. per day per sq. in. × 10^{-3}	
					Dry.	Wet.
Forged steel	1.0	None	47 surface 60 under surface	1,095	0.334	4.30
5165 forged steel	0.65	0.90 Cr, 1.0 Mn	47—51	5,165	0.360	—
As above (pack carburized)	0.65	0.90 Cr, 1.0 Mn	59—61	5,165	0.115	—
As above (gas carburized)	0.65	0.90 Cr, 1.0 Mn	61	5,165	0.025	4.15
Forged, 0.95 C	1.0	None	52—60	1,095	0.433	—
Forged, Cr, Mn	1.0	1.45 Cr, 0.40 Mn	63—65	52,100	0.482	—
Forged 1095	1.0	None	65—66	1,095	0.550	—
Forged 1045	0.46	None	58—60	1,045	0.650	—
Stainless, hard	1.0	17 Cr	62—64	440 C	—	3.50
Stainless, soft	1.0	17 Cr	31—33	440 C	—	6.00
White CI ..	2.80	0.40 Si	49—50	Cast	—	5.60
Alloy white CI	3.10	3.25 Ni, 1.45 Cr	55—60	Cast	0.017	3.85

The cast materials tested were the Ni-Cr alloyed white irons and unalloyed white iron. The specimen balls were weighed, irradiated to different levels for each group, and the specific radioactivity of each ball was determined. In the dry-grinding test, one group was given the minimum irradiation time and the remaining nine groups were irradiated for times that were increased by 33 per cent. from that of each preceding group.

Ten groups of balls with 13 to 18 balls per group were charged into a "finish grinding" (dry) cement mill operating with about 40 tons of balls. This mill had a 7-ft. dia. and was 26-ft. long. It operated in closed circuit with air separators to produce a 95 per cent. minus 325-mesh product. After 2,006 hours of normal production operation in the dry-grinding mill, the mill charge was dumped and screened to separate the balls from the cement.

In evaluating the balls on the basis of weight loss or wear, the wear rate in oz. per day per sq. in. of surface area was determined for each group tested in the dry mill and for the three periods for each group run in the wet mill. These data are based on the average surface area of the ball during the testing period.

Valuation of Data

The results for dry grinding showed that the cast nickel-chromium alloy white iron and the gas-carburized steel (Society of American Engineers 5165 specification) at 61 Rockwell C hardness had the best wear resistance of those tested. The wear rates for wet grinding showed that the conditions which cause wear in the wet mill are considerably more severe than those in the dry mill. Wear rate of the regular-production balls was more severe than those in the dry mill. Again, wear rate of the regular production balls was more than 11 times greater in the wet mill than in the dry mill. Wet-mill wear rates of the cast alloy white iron balls and the gas-carburized SAE 5165 steel balls were approximately 200 times greater in the wet mill than in the dry mill. This shows that these two groups of balls, which had by far the lowest wear rates in the dry mill, had only slightly lower wear rates than the regular forged balls of SAE 1095 steel in the wet mill.

Conclusions

This study has shown that the wear rates of 1-in. grinding balls in a dry cement mill are lowest when the microstructure of the balls consists of massive carbides in a martensitic matrix with a hardness of about 60 Rockwell C. In wet-grinding cement, the combined effects of corrosion and abrasion cause much higher wear rates for all types of grinding balls. The wear rate, though related to hardness, is substantially independent of alloy additions and massive carbides. If greatly lower wear rates are to be achieved in the wet mill, it may be necessary to consider non-ferrous alloys such as hard copper-, cobalt-, or nickel-base alloys.

British Standards Institution

The *News Sheet* of the British Standards Institution for May, 1958, lists a new code of practice: B.S. C.P.: 1008: 1958 Maintenance of electrical switchgear. This code gives recommendations to those responsible for maintaining one or more of three principal groups of switchgear, namely, composite units of switches and fuses, air-break switchgear, and oil switchgear. Brief reference is also made to air-blast switchgear. In addition to recording those matters which experience has shown to be of importance in keeping electrical switchgear and its auxiliary devices in good working condition, attention is drawn to the precautions which should be observed in order to secure safety of personnel whilst maintenance work is in progress. The code, which costs 8s. 6d., supersedes B.S. 1086:1942 which dealt with the same subject.

Revised British Standards include B.S. 482:1958 Wrought iron and mild-steel hooks for cranes, slings, blocks and general engineering purposes (excluding building operations), in which six types of hook are specified, namely, trapezoidal and circular-section shank hooks, trapezoidal shank hooks with integral collars, trapezoidal and circular-section eye hooks for use with chain or with shackles, and trapezoidal eye hooks for use with wire-rope thimbles. The safe working loads of the largest hooks are 50 tons for trapezoidal shank hooks, 13½ tons for trapezoidal eye hooks and 5 tons for circular-section hooks. Material, form, dimensions, screw threads, heat-treatment, proof testing, inspection and marking are specified. Appendixes give information which should be supplied with the enquiry and order; certificate of test and examination; details of Whitworth and Unified screw threads; and notes on design. It is pointed out in the foreword that hooks outside the standard range can be designed on this basis, but that the term "British Standard Hook" is restricted to the actual forged hook sizes and forms laid down in the tables and figures of the standard (price 8s. 6d.).

Another revised standard is for B.S. 1610:—Methods for the verification of testing machines. Part 1:1958. Methods of load verification requirements for elastic proving devices and verification of machines for tension and compression testing. The revised edition gives a more realistic standard for loads above 50 tons force, and the accuracy in this range is now in agreement with the provision of American and Continental standards. Below this range, greater accuracy is required and to cover this need a section had been added dealing with the requirements for calibration and the use of elastic proving devices. The new section relating to elastic proving devices for the verification of testing machines, covers only those devices in which the load is determined by measurement of the elastic deflection of a loaded member. The cost of this revised standard is 6s.

Amendment slips have been issued to B.S. 2512:1954 Gas-heated catering equipment (amendment No. 1); and to B.S. 2929:1957 Safety colours for use in industry (amendment No. 1). Reference numbers for ordering are PD 3014 and PD 3021 respectively. It is also announced that new work has been started on standards for railway wheel centres and monobloc wheels and the classification and inspection of castings. Draft standards which have been issued, and on which comment would be appreciated, include CY 5245 Method for the direct determination of silica (addendum to B.S. 1902) and CY 5277 Test sieves for use with coke and similar abrasive substances (Part 5 B.S. 5410); the cost of these is 2s. Copies of all the above-mentioned are obtainable from the sales branch of the British Standards Institution, 2, Park Street, London, W.1.

Information is also given in the news sheet that at the International Standards conference (currently being held at Harrogate), ISO technical committee No. 17 was to present its report on steel, technical committee No. 26 would deal with copper and copper-alloys, whilst committee No. 25 would report progress made on matters concerning cast iron.

Southampton Metallurgical Society

The annual meeting of the Southampton Metallurgical Society was held in the Senior Common Room of Southampton University, recently.

The president (Dr. O. P. Einerl), stated that the session had been a very successful one, and hoped that as the Society was now associated to the Institute of Metals, more people who were interested in metallurgy would join in the meetings in the coming sessions.

The following officials were elected: As president, Dr. Einerl (Thornycrofts); vice-president, Mr. T. R. S. Williams (Southampton University); honorary secretary, Mr. S. W. Hallwood (Folland Aircraft, Limited); honorary treasurer, Mr. Bunce (Pirelli General Cable Works, Limited); committee, Mr. Freeman (G.E.C., Portsmouth) and Mr. G. B. Evans (De Havilland Aircraft, Christchurch).

After the meeting, the wives and friends of the members and guests of the Society, which included Professor Richards, Dr. and Mrs. Foyle, and Dr. Clarkson, of the University, were entertained to a sherry party.

Increasing Competition and Fewer Inquiries in British Shipbuilding

"Exorbitant and unrealistic wages and other claims, backed by strikes or other forms of militant action, can only impair our competitive efficiency and damage our reputation," said Sir Frederick Rebbeck, chairman and managing director of Harland & Wolff, Limited, at the annual meeting at the end of last month. The shipbuilding industry was experiencing a diminishing number of inquiries for new tonnage and increasingly competitive conditions, he said, in stressing the importance of the company's employees appreciating the necessity for "wholehearted concerted effort" to maintain efficiency and reduce costs.

The reduced profit was attributable in no small measure to interruptions caused by strikes and labour disputes and, so far as ship construction was concerned, progress was hindered by these causes and the consequences of deficiencies in steel supplies. Maintaining a balanced programme and meeting commitments involved additional costs which were not recoverable in the final prices of the contracts; nevertheless, the dividend would be held at 10 per cent.

TECHNICAL DESIGNS, LIMITED, have appointed Mr. P. B. Ward as sales manager. Prior to this appointment he was sales manager with Danite Hard Metals, of Doncaster, and previously with Deloro Stellite of Birmingham.

HENRY WIGGIN & COMPANY, LIMITED, Birmingham, will be amongst the exhibitors at the Chemical and Petroleum Engineering Exhibition (Olympia, June 18 to 28), at stand No. 3, in the Grand Hall, Row C. Exhibits will demonstrate the suitability for different types of service of the company's special alloys, which include nickel, Monel and Inconel, and the more recent development, Corronel "B," Ni-o-nel, the Nimonic series and Incoloy.

Success Stories from Cleveland

From the British Moulding Machine Company, Limited, Faversham, comes a report of very satisfactory results from their participation in the "Foundry Show" held in connection with the annual congress of the American Foundrymen's Society at Cleveland, last month. The company exhibited one of their new (BQ 1) automatic moulding machines and a type BT 1 (turnover) machine, both of which were sold on the spot (Fig. 1). Several more orders have been received from companies in the USA and Canada, and since numerous requests have been made by foundrymen from these countries for B.M.M. representatives to visit them and discuss specific requirements, the prospects for further orders are extremely good.

Another success story comes from Foundry Equipment, Limited, Leighton Buzzard, Bedford, who report that in addition to actual sales made at the exhibition, enquiries were received on such a scale that the group is increasing the sales staff of its North American subsidiary to deal with them.

News has been received of yet another UK firm, Foundry Services, Limited, of Nechells, Birmingham, which through its American associate company, took part in the Cleveland Foundry Show. The stand occupying some 1,200 sq. ft., was devoted to "highlighting" the international aspect of this organization, and the display included, amongst a full range of the company's products, treated castings collected from various parts of the world. An outstanding section was an area, approximately 18 by 14 ft., set aside as a small foundry. Here a 100-lb. capacity Lindberg electric-resistance furnace was used to melt aluminium in a demonstration of results obtained when using exothermic aids to feeding—in this case for ingots. Metal-refining treatment and degassing were also demonstrated.

The Porotec machine—which is a portable unit for the rapid detection of gas in light alloys—was used to show the effect of degassing. This equipment is designed to highlight faulty degassing procedure and enable the operator within a matter of about two minutes to determine the presence of gas in the molten metal, so that there is ample time in which to carry out corrective treatment. Another feature was the technical service which the company has made available for the free analyses of unsound castings and recommended corrective treatment.

The photograph below shows part of the stand of Sklenar Furnaces, Limited, at the "Foundry Show." One of the firm's 50/150 melting furnaces was arranged as a "live" exhibit, *i.e.*, melting and casting were carried out. The large audience (only part of which is shown) was eloquent testimony to the value of practical demonstrations—especially of melting and casting—at such exhibitions. Another exhibit, which aroused much interest, was a Reverbale junior furnace. The Sklenar stand at Cleveland was similar to those arranged in Hanover and Milan at recent trade fairs in those places.

FIG. 1.—*Section of the stand of the British Moulding Machine Company, Limited.*

Turner Brothers' New Plant in Scotland

The importance of tool-making in the development of light engineering in Scotland has been constantly emphasized by the Scottish Council (Development and Industry), and the opening of the first Scottish plant of Turner Brothers (Birmingham), Limited, one of the largest contract toolmakers in Britain, enables a significant increase to be made in Scotland's capacity for the production of high-grade tools. The new factory, on the Blantyre industrial estate, was opened on June 2, and to mark the event a luncheon was given in Hamilton on the same day.

The company, which has eight factories in Birmingham, is the second of its type to start up in Scotland, and already at the new factory production is under way on the manufacture of jigs, fixtures and press tools. For the time being, only 5,000 sq. ft. have been taken over by Turner Brothers, but Mr. R. M. Bowie, Scottish area manager, who is in charge of the factory, has pointed out that production can expand rapidly as orders come forward. According to his estimate, between £3,000,000 and £4,000,000 worth of orders for press tools go to England from Scottish Industrialists each year.

Mr. Allen Young, Board of Trade Controller for Scotland, who was present at the luncheon, said that it was not narrow Scottish nationalism that made him begrudge the loss of the orders that went over the Border, but it was because he knew that the development of light industry was the only way in which Scotland could change from a static to an expanding economy.

Factory Painting

A new Order which permits the use of emulsion paint for decorating inside walls and ceilings in factories had been made by the Minister of Labour and National Service, and will come into force on June 16. The order, The Factories (Cleanliness of Walls and Ceilings) Order, 1958 brings the requirements imposed by Section 1(*c*) of the Factories Act, 1937 for the periodical washing and painting of internal walls, ceilings, etc., into line with modern developments in paint manufacture. The quality of the emulsion paint to be used is defined in the Order and manufacturers of the paint are required to furnish a certificate, the form of which is set out in the Schedule to the Order, to the effect that the paint is of the defined quality. The Order further specifies that two coats of emulsion paint must be used in the first instance, that this must be renewed with at least one coat of paint every 5 years, and the walls and ceilings must be washed every 14 months. The dates of painting and washing and the maker's certificate of the quality of the paint are to be filled in in the general register of the factory.

Reductions in ICI Titanium Prices

Substantial reductions in titanium prices were announced by the metals division of Imperial Chemical Industries, Limited, on June 4. Wrought titanium and alloy products delivered after July 1 will be cheaper by between 5 and 20 per cent., as a result of "rationalization of the price structure." Effect of these cuts will be to reduce the price of a typical titanium rod from 95s. to 75s. per pound, while sheet will cost £6 instead of £6 10s. Individual reductions will vary according to quality and other considerations.

Foundry Workers to press for Wages Advantages

Not to press forward vigorously for a wages advance would be a betrayal of trust, said Mr. F. Hollingsworth, chairman of the National Union of Foundry Workers, at the annual delegate meeting at Morecambe last week. A resolution calling for an immediate wage increase and another demanding a 40-hour week without loss of pay were carried.

Quoting an analysis by the *Economist* of 420 company reports, Mr. Hollingsworth said that during the first quarter of the year their gross trading profit had risen by 11½ per cent., the iron and steel concerns coming off best with a profit increase of nearly £22,000,000, to make a total of £136,492,000.

"The Government not only expects, but welcomes some increase in unemployment. The restraint on the development of nationalized industries has its effect on the demand from industries serving them," he said. The continued pressure to reduce home demand by the Government's restraint on investment and its wage-freeze policy, he added, would reduce production still further and create more unemployment.

More Work for Woodall-Duckham's

During 1957 the value of work carried out by the Woodall-Duckham group of companies, contractors and engineers to the gas and coking industries, exceeded £15,000,000, some £1,400,000 more than in 1956, and the group had about £22,000,000 of unexecuted work on hand at the end of last year, states Mr. T. C. Finlayson, chairman. But although orders were up last year they were exceeded by output to the value of some £3,000,000. Contracts tended to become larger and fewer, he said, and profits would probably fluctuate more widely in the future.

Group net profits expanded from £520,756 to £609,836 in 1957. The 20 per cent. dividend on a capital increased by a 100 per cent. scrip issue and shares issued against an acquisition requires £145,923, against £86,250 absorbed by the previous year's 25 per cent. dividend.

North Central Wagon Company's Turnover Increased

New business of more than £30,000,000 was financed last year by the North Central Wagon & Finance Company, Limited, compared with some £17,500,000 in 1956, state the directors. In the first four months of this year group turnover increased by 9 per cent. in value and by 11 per cent. in the number of transactions financed. The decrease of £240,647 to £1,079,733 in group profits, before tax, mainly reflects the decrease in new business in 1956 following hire purchase and credit sale restrictions and dearer borrowed money.

The group net profit of £536,572 compares with £654,531. The dividend of 1s. 6d. per £1 share and a special distribution of 7½d. per share, not subject to tax, are equivalent to the 1956 payments. CIC consent has been received to the proposed one-for-three scrip issue, and the directors intend to recommend the same rate of dividend and bonus on the enlarged capital for 1958.

Mr. ERIC MENSFORTH, managing director of Firth-Brown Tools, Limited, Sheffield, and chairman of Westland Aircraft, Limited, has been made president of the Helicopter Association of Great Britain—a position he has held several times previously.

Processing Castings at Petters

Emphasis on Shot-blasting before Machining

Our representative recently had the opportunity of seeing the extensions and reorganization of the diesel-engine works of Petters, Limited, of Staines, Middlesex. The engines produced at Staines range from 1½ to 20 b.h.p. and for their production, about 1,000 people are employed. The factory was established in 1914 and, frankly, the buildings were old-fashioned in construction. Over the last few years, however, it has been virtually rebuilt, involving floor levelling, new roof construction, and the installation of much mechanical-handling equipment. This reconstruction has been materially helped by the making and intensive use of a three-dimensional model, complete with all the machine tools—700 if the writer's memory is correct—to a scale of ⅜-in. to 1-ft.

About threequarters of the total of components going through the machine shops are iron castings and, as there is no foundry attached to the works, large batches are received daily. Obviously buffer stocks have to be carried and obviously, too, the degree of rusting of the castings in store varies with the length of time of exposure. As the manager rightly attaches much importance to tool life, which is adversely affected by rust, dirt and grit, the firm has recently installed a Tilghman continuous shot-blast plant, which is illustrated in Fig. 1. This is of the airless type in which steel shot is fed from a hopper situated on top of the plant by pipes to the centre of four Wheelabrator units—each driven by a 20 h.p. motor. The spent shot is collected in a hopper at the base of the machine and returned by bucket elevators to refill the overhead hopper.

Casting Handling

Castings to be shotblasted are loaded direct from pallets by air hoist or by hand on to hooks suspended from a continuous overhead chain conveyor. After passing through the machine, they are similarly unloaded into waiting pallets for delivery to the machine shop. The plant handles some 35 tons of castings per day. For small work, there is a Tumblast treatment plant of the sort which is now familiar to foundrymen. During the passage of the castings through the works, they are washed—again to prolong tool life.

Seeing this plant, the writer wondered how much power was wasted by foundries in supplying shot-blasted castings to those engineering works where they are subsequently re-treated. It might be conducive to national economy if castings manufacturers satisfied themselves as to the methods of ultimate processing given to their castings after delivery to the machinists. Maybe the duplication of a cleaning process could be avoided by instituting the application of a protective film to prevent rusting in storage.

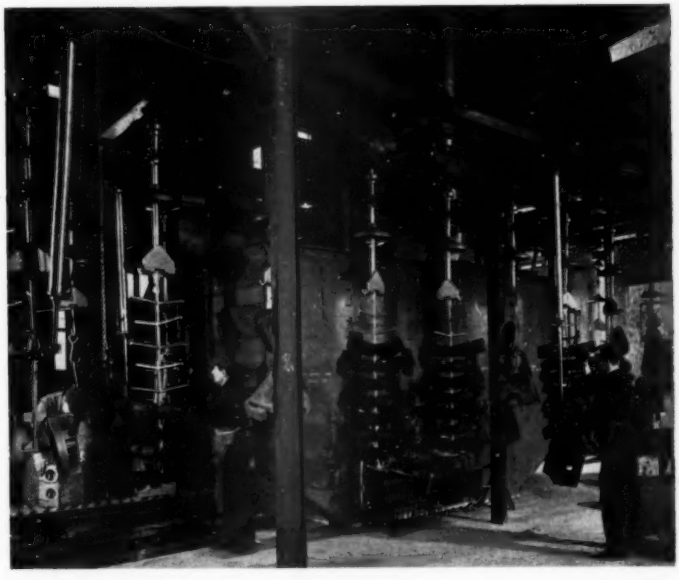


FIG. 1.—*Loading and unloading points on the continuous Tilghman shot-blasting plant installed for treating incoming castings at the Staines works of Petters, Limited.*

SIR W. G. ARMSTRONG WHITWORTH (AIRCRAFT), LIMITED, of Coventry, is to add to its equipment a £55,000 electronic computer stated to be one of the most powerful of its kind in the country. The computer is capable of studying the performance of complete new guided-weapon and aircraft systems while still on the drawing board. It is due to be in operation by July, 1959.

Mr. E. F. HODGES, metallurgical and foundry consultant, has changed his address to York House, York Road, Waltham Cross, Herts.

THE OFFICES AND SHOWROOMS of the North-East region of Philips Electrical, Limited, have been removed to 72, Wellington Street, Leeds, 1., with the trade counter and stores at 2, Britannia Street, Leeds, 1.

Personal

Mr. ALFRED D. VICKERS has been appointed a director of Braithwaite & Company, Engineers, Limited.

Mr. W. B. HENDRY, lecturer at the National Foundry College, is leaving shortly to take up a foundry appointment with Distington Engineering Company, Limited.

Mr. R. G. FRIEND has been appointed director of Electronics Research and Development (Telecommunications) at the Ministry of Supply in succession to Brigadier J. D. HAIGH.

Mr. JAMES A. DEWHIRST has been appointed director and general manager of Midgley & Sutcliffe, Limited, machine-tool manufacturers of Leeds, following the resignation of Mr. GORDON HAITHWAITE from the board.

Mr. ROBERT C. BOOTH, a deputy secretary since 1948 of the Manchester Chamber of Commerce—the largest outside London—has been appointed secretary of the Birmingham Chamber, with effect from September.

Mr. HARRY C. MACEWAN, chief electrical engineer and a director of Harland & Wolff, Limited, shipbuilders and engineers, of Belfast, has retired after 46 years' service with the company. He became head of the electrical department in 1948 and joined the board five years later.

Mr. JOHN O. SEWELL has been appointed assistant general manager of the British Divisions of the Yale and Towne Manufacturing Company, Limited. Mr. Sewell who is a Canadian, came over to the British Divisions of Yale as comptroller three years ago. He will continue to act as comptroller.

Mr. D. A. MALTHA has retired after representing Head, Wrightson & Company, Limited, engineers and iron and steel founders, of Thornaby-on-Tees, in Holland for 30 years. A presentation at the company's works last month was made to Mr. Maltha by Sir John Wrightson, vice-chairman and managing director of Head, Wrightson & Company.

Two members of the Swinden House Research establishment of the United Steel Companies, Limited, have been awarded jointly a William Prize for 1957 of £100 by the Iron and Steel Institute. They are Mr. C. HOLDEN, acting head of the furnace design section, and Mr. A. D. ROBERTSON, a technical assistant in the fuel section, and they received the award for a paper on the "Protection of Refractories by Moving Air Curtains." Dr. J. H. Chesters, assistant director of research, was also involved in the paper but is ineligible for an award because of his senior position.

The West Midland Region of the Institute of the Motor Industry has re-elected as regional chairman, Mr. J. CLIVE DENLEY. The following officers have also been elected:—As deputy chairman, Mr. G. J. LAKIN; as honorary secretary, Mr. F. R. FREEMAN; and as treasurer, Mr. L. S. PREWITT. Appointed to the committee were:—Mr. V. C. G. Beaumont, Mr. C. C. Clarke, Mr. J. W. Gethin, Mr. F. I. Goodwin, Mr. R. E. Green, Mr. G. C. Hill, Mr. John Howell, Mr. J. H. Ingram, Mr. P. W. Johnson, Mr. M. F. Liddiatt, Mr. G. T. Newbury, Mr. F. H. Realf, Mr. S. L. Sadler and Mr. E. Cawood.

Mr. FRANK ALLEN, chief fire officer of the Lancashire factories of Leyland Motors, Limited, has been elected chairman of the British Fire Services Association (north-western area). His first duty as chairman was to instal Lord COUSINS-HARDY as president of the Association in this area. Joining the company as a trade apprentice in 1930, Mr. Allen became a part-time member of the works fire brigade in 1938. In 1947, as the brigade's second officer, he left the company to become fire officer at the oil refinery installation of the Anglo-Iranian Oil Company, Limited, at Abadan. He was appointed Leyland's chief fire officer in 1953.

Former Engineer-in-Chief of the Fleet, Vice-Admiral Sir FRANK MASON has been appointed to succeed Sir Andrew McCance, F.R.S., as chairman of the Mechanical Engineering Research Board of the Department of Scientific and Industrial Research. Sir Andrew, who is chairman and managing director of Colvilles, Limited, has had a long association with the DSIR. He was a member of its advisory council from 1942 to 1947 and in the following year was elected a member of the Mechanical Engineering Research Board. He has served as chairman since 1952. Admiral Mason entered the Royal Navy in 1918 and in 1921 elected to specialize in naval engineering, studying at the Royal Naval College, Greenwich, and the Royal Naval Engineering College, Keyham. Promotion followed quickly on promotion and as Commander (E) he was the first engineer officer to fill a staff appointment in the famous gunnery establishment, HMS Excellent. At the Department of the Director of Naval Ordnance he helped in the planning of the Pacific War and in 1949 he was the first engineer officer to pass through the Imperial Defence College. He was promoted to the rank of Rear Admiral (E) and appointed deputy Engineer-in-Chief of the Fleet in 1950, his promotion to Vice-Admiral following three years later. On his retirement from the Navy, Admiral Mason entered industry and became consultant to the Metropolitan-Vickers Electrical Company, Limited. He is a director of Metal Industries, Limited, and of H. W. Kearns & Company, Limited.

Obituary

Mr. JOHN M. MORRIS, first president of the British Industrial Truck Association, died at Leamington on June 3 at the age of 53. Mr. Morris, who was a prominent figure in the mechanical-handling industry, received his engineering training at the works of Alfred Herbert, Limited, Coventry. He served as London and later Glasgow manager of A. C. Wickman, Limited, and afterwards as sales director of Coventry Climax Engines, Limited.

Mr. WILLIAM HUNT EISENMAN, secretary and a founder-member of the American Society for Metals, died on May 30, at the age of 73. Mr. Eisenman, who served the American Society for Metals for 40 years, was managing director of the National Metal Exposition and Congress ("Metal Show"), and also directed the Western Metal Exposition and Congress biennially at Los Angeles, for 20 years. Shortly before his death he had launched the new Southwestern Metal Exposition and Congress, at Dallas, Texas.

Mr. LESLIA W. R. ROBERTSON, a former manager of the armaments division of Sir W. G. Armstrong Whitworth (Aircraft), Limited, died on June 3 at the age of 62. He joined Armstrong Siddeley Motors, Limited, in 1934, as manager of the railcar department formed to exploit the licence from the Michelin Power Company, of France, for pneumatic-tyred railcars in Britain and the Commonwealth. Mr. Robertson was a member of the Institution of Mechanical Engineers and of the Institution of Locomotive Engineers.

Company News

JOHN LYSAGHT, LIMITED, holding company for pig-iron and steel manufacturers, etc., of Bristol—After depreciation of £697,274 (£761,963), group trading surplus for the year ended December 28, 1957, is a record at £2,823,487 (£2,397,435) plus other income of £36,536 (£13,119).

LANCASHIRE STEEL CORPORATION, LIMITED—The directors have declared an interim dividend on the ordinary shares of 4 (3) per cent. They state that the increase is to effect a more suitable relationship between the interim and the final and should not be taken as an implication of an increase in the total dividend.

S. RUSSELL & SONS, LIMITED, general engineers and ironfounders, of Leicester—Gross profits for the year ended March 31, 1958, at £149,721, were £27,849 lower. The 17½ per cent. dividend is retained, with the announcement of a 12½ per cent. final. Tax absorbs £75,669 (£87,123), leaving a net profit of £74,052, against £90,447.

WM. NEILL & SON (ST. HELENS), LIMITED, engineers, mining locomotive manufacturers, etc., St. Helens Junction (Lancs)—The company is paying a first and final dividend of 33⅓ per cent. (same) for the year ended March 31, 1958. Net profits were £164,862 (£166,570), to which was added a tax provision not now required of £20,000 (nil).

MORGAN CRUCIBLE COMPANY, LIMITED—The 10 per cent. dividend is being repeated with a final of 6¼ per cent. for the year ended March 30, 1958. The final is payable on an additional 100,740 "A" ordinary £1 shares issued in January against the acquisition of a further holding in the Ship Carbon Company of Great Britain, Limited. Group profits, subject to audit, fell to £1,901,479 (£2,037,826), and the net balance, including surplus tax provision credited, is £948,904 (£1,034,827).

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference HSB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

INDIA, June 20—Oil-fired furnace. (ESB/13713/58.)
BURMA, June 16—Phosphor-bronze rods. (ESB/13938/58.)
SOUTH AFRICA, June 19—Drilling machines. (ESB/13516/58.)
CEYLON, June 24—Foundry plant, including crucible melting furnace; pyrometer; foundry torch; moulders tools and pressed steel ladles and steel moulding flasks or boxes. (ESB/13813/58/ICA.)
GREECE. Repeat of call for tenders for foundry crucibles. (ESB/13007/57.)
INDIA, June 19—Oil-fired annealing and normalizing furnace. (ESB/13713/58.)
SOUTH AFRICA, July 3—Woodworking machinery. (ESB/14071/58.)
SOUTH AFRICA, June 26—Tractors and attachments. (ESB/14072/58.)
INDIA, June 27—Cupola charging machine. (ESB/14373/58.)

Ford Thames Foundry—A Correction

Foundry Equipment, Limited, point out that Fig. 25 (page 645) of the account of the Ford Thames Foundry printed in the JOURNAL of May 29 is wrongly captioned. The machine illustrated is in fact an FE 220 coreblower with a series 500 rollover/stripping device and not an Osborn machine, which was stated in the caption. Apologies are due to all who may have been misled.

United Steel Appointments

Changes in appointments at senior managerial levels were announced by the United Steel Companies, Limited, recently. Lt.-Cmndr. G. W. Wells, at present managing director (engineering), has been appointed managing director (production), responsible to the general managing director, Mr. A. J. Peech, He will continue to hold the position of general manager of the Appleby-Frodingham Steel Company (branch of the United Steel Companies, Limited).

Following this appointment, Mr. A. Jackson will relinquish his position as general works manager of Appleby-Frodingham as soon as possible in order to take up a new appointment as technical adviser on steelmaking for United Steel, responsible to Cmndr. Wells. He will become technical director of the company and also join the boards of the other three steelmaking companies in the group—Steel, Peech & Tozer (branch of the United Steel Companies, Limited), Samuel Fox & Company, Limited, and the Workington Iron & Steel Company (branch of the United Steel Companies, Limited).

Mr. J. D. Joy will relinquish his position of general works manager at Samuel Fox on August 31, and will move to Appleby-Frodingham as a director and general works manager with a view to becoming deputy general manager on January 1, 1959.

Joshua Bigwood: "Difficulty Frustration, and Change"

Chairman and managing director of Joshua Bigwood & Son, Limited, engineers and ironfounders, of Wolverhampton, Mr. H. R. Rowbotham, says that the year ended December 31, 1957, was "a period of difficulty, frustration, and change," the company's material reward for which was as irritating to the board as it must have been to shareholders.

Governmental finance policy during the year caused many firms to defer the acquisition of new equipment, and foreign clients because "of the apparent inability of governments and international agencies to provide a readily acceptable means of exchange between nations" were prevented from buying plant the company could have supplied.

Company reserves have risen by almost £100,000 in the past 10 years and a 10 per cent. final is recommended, which with a 5 per cent. interim makes 15 per cent. for the year.

Balfour's Concentration on Modernization

Keynote of 1957 for Arthur Balfour & Company, Limited, makers of high-grade steels, etc., of Sheffield, was the concentration of the company's financial and engineering resources on a project to modernize and increase the capacity of the high-frequency melting units and all the ancillary processes.

By the end of 1958, states the chairman, Lord Riverdale, the company would be operating a high-frequency melting unit with the highest power per ton in the world, backed by modern handling techniques. The financing of this scheme from the company's own resources had proceeded within the budgeted expenditure, but the maximum call on funds was expected to occur towards the end of 1958. In the early months of this year the plant has been operating at reasonable levels, but deliveries have exceeded orders.

News in Brief

HEBBURN-ON-TYNE URBAN DISTRICT COUNCIL has approved plans for shipyard extensions by Hawthorn Leslie (Shipbuilders), Limited.

HULL GENERAL PATTERN WORKS, Strawberry Street, Hull, was admitted to membership of the National Society of Master Patternmakers at its Council meeting, last month.

THE Federation of Light Metal Smelters announces that its members' average selling prices for April (calculated to the nearest 10s.) were:—LM1, £151 per ton; LM2, £158; LM4, £179; LM6, £195.

SHIPMENTS from the port of Sunderland during April decreased by 9,412 tons compared with last year to 201,013 tons. In the first four months of this year 840,515 (916,513) tons of coal and coke left the Wear.

REPUTED TO BE one of the finest examples of the work of Robert Bakewell, the famous Derbyshire ironsmith, a pair of gates is being erected by Derby Corporation outside Derby Cathedral and will be dedicated on June 28.

K. & L. STEELFOUNDERS AND ENGINEERS, LIMITED, Letchworth, announce that for their annual holiday the works will be closed from 4.30 p.m. Friday, August 8, until 7.30 a.m. Monday, August 25. During this time no goods will be despatched or received.

A NEW CENTRE for continuous research and development on domestic heating appliances has been set up by Newton Chambers & Company, Limited, Thorncliffe, Sheffield. The centre is located in the company's recently constructed engineering development building.

AT the Chemical and Petroleum Engineering Exhibition, to be held at Olympia from June 18 to 28, Joshua Hindle will exhibit a stainless-steel gate valve. The valve, which weighs more than a ton, and stands nearly 10-ft. high, is claimed to be the largest ever to be made in Britain.

THE VALUE AND LOW COSTS OF ALUMINIUM for overhead lines and underground cables was stressed by Mr. W. S. Lewis, chairman of the Midlands Electricity Board, when on June 2, he opened the largest British store of the British Insulated Callenders Cables, Limited, in Holloway Head, Birmingham.

AN AGREEMENT has been concluded by A. F. Craig & Company, Limited, mechanical engineers, ironfounders, etc., of Paisley, with the Hudson Engineering Company, of Texas, whereby the company becomes the sole manufacturer under licence in the UK of the range of Hudson air-cooled heat exchangers.

"NEWS FROM UNITED STEEL," the monthly review of the United Steel Companies, Limited, Sheffield, has been awarded a certificate of merit in a national house journal competition organized by the British Association of Industrial Editors. The editor is Mr. David J. King. This is the first year that the review has been entered for the competition.

HUDSWELL, CLARKE & COMPANY, LIMITED, locomotive engineers, of London, S.W.1, has received from the Crown Agents for Overseas Governments and Administrations an extension to its contract for a further eight main-line diesel hydraulic locomotives for the Sierra Leone Government railway. This brings the number of locomotives the company is building for the railway up to 16. The total value of the contract is about £500,000.

THE FIRST AIRCRAFT for the new West German Naval Air Arm to be delivered direct from this country to Germany left the makers' airfield at Bitteswell, Leicestershire on June 2. They were three Sea Hawks multi-purpose aircraft built by Sir W. G. Armstrong Whitworth (Aircraft), Limited, of Coventry. The planes were flown to Bremen by the firm's chief test pilot, Mr. Eric Franklin, and test pilots Mr. W. Else and Mr. J. McCowan.

NEARLY 50,000 TONS more iron ore were exported to the United Kingdom from Sierra Leone during the first three months of this year than in the same period last year. Figures published in London show that 194,980 tons were imported by the United Kingdom from Sierra Leone from January to March this year, as compared with 147,114 tons during the first three months of 1957. In the month of March this year, 62,450 tons of Sierra Leone iron ore were exported to the United Kingdom.

AN ORDER worth £25,000 has been received by the General Electric Company, Limited, for the supply of 100 specially designed air circulation catering ovens for the Scandinavian Airlines System. They are to be installed in long-range jet airliners which SAS has on order. BOAC has also placed an order worth £13,500 with GEC for equipment for the galleys of its new Comet 4 fleet, and British European Airways has specified GEC catering equipment for its fleet of Vickers Vanguard turbo-prop airliners.

THE HOLMAN GROUP, of Camborne, Cornwall, which is already making important sales of pneumatic equipment to the Polish mining and civil engineering industries, is exhibiting at this year's International Fair at Poznan—the fourth year running that the group has exhibited there. One of the most important exhibits is the firm's Dryductor drill which has made dry, dust-free rock drilling a reality. Dust and small particles of rock are drawn away by suction from the working face through the hollow drill steel and through the drilling machine to a dust collector.

PRESENTATION OF SAFE-DRIVING AWARDS took place last week at Stanton Ironworks Company, Limited, near Nottingham. Mr. R. Emmerson, who was named the company's safest driver, received a second bar to his 15-year safe-driving medal, and Mr. J. H. Brown, Mr. L. Eerey, Mr. H. Clay, Mr. F. E. Dickens, Mr. N. D. Harvey and Mr. L. Pickworth, were presented with bars to their 10-year medals. Mr. L. Winfield received a 10-year medal. The presentations were made by Mr. C. G. Mackie, assistant managing director (commercial) who gave awards to 63 of the 71 drivers employed by the firm.

RETURNING RECENTLY from a 5,000-mile sales and demonstration tour to points in Franch, Spain, Portugal and Italy, the new Smiths Dove aircraft successfully completed the first of a series of planned visits to the Continent. The specially-equipped Dove was used to demonstrate the latest Smiths auto-pilot and flight direction equipment as well as cockpit and navigational instruments. Included in its total of 50 hours of flying were over 15 hours on purely demonstration. Mr. R. A. Palmer, chief pilot, Smiths Aircraft Instruments, Limited, was in command of the aircraft.

A 300-TON GOLIATH crane, which when completed next month, will, it is claimed, be the largest operating crane of its kind in the world, is being built at Hunterston Atomic Power Station, in Ayrshire, by the Motherwell Bridge & Engineering Company, Limited. Their share of the contract in connection with the development of this station is in the region of £8,000,000. The crane, which will be able to lift weights of 300 tons to a height of 200 ft., is capable of travelling approximately one-fifth of a mile. It will be used for lifting pressure vessels from the site

workshop to the reactor site, thus enabling the Class 1 pressure vessels to be welded under cover.

THE JOHNSTONE (RENFREWSHIRE) FIRM of Clifton & Baird, Limited, machine-tool makers, celebrated their jubilee with an outing to Ayr recently, when a large company of employees, with their families and friends were the guests of the directors. Mr. G. Morris Hay, the managing director, welcomed the guests after luncheon, and presented the oldest employee—Mr. George Thomson—with a gold watch suitably inscribed. Watches were also presented to a further 30 long-service employees, while the others received gifts as a memento of the jubilee. Mr. S. Emery, general manager, called on Mr. Thomson to present a coffee set to Mr. and Mrs. Hay.

COPIES OF THE FILM, "Forming of Metals," made by the Shell Film Unit in co-operation with the Sheffield steel industry, were presented to the City of Sheffield, English Steel Corporation, Limited, Steel Peech & Tozer, Limited, and the British Iron and Steel Research Association, at a luncheon given by the North Eastern division of Shell-Mex and B.P. Limited, in Sheffield on May 28. The film has already been shown at practically every large steel and engineering firm in the north. The following day it was announced that the film had been awarded the Grand Prix for short films at the World Film Festival at Brussels, competing against 54 other films from 25 countries.

THE SHEFFIELD ADVISORY PANEL for the Re-Settlement of Ex-Service personnel was inaugurated at a luncheon at the Grand Hotel, Sheffield, on May 28, under the chairmanship of Lieutenant-Colonel M. W. Batchelor. Among those present were Mr. F. S. Beale, director of English Steel Corporation, Limited; Mr. Andrew Hahn, secretary of Sheffield Chamber of Commerce; Mr. W. G. Ibberson, former Master Cutler and former president of the Chamber of Commerce; Mr. T. W. Sherratt, chairman of Sheffield Officer Managers' Association; Mr. C. N. Taylor, director of Sheffield and District Engineering Trades Employers' Association; Mr. E. A. Tuxford, secretary of Sheffield Lighter Trades Association, and Mr. G. S. Willis, director of Tinsley Rolling Mills, Limited. The first re-orientation course lasting six weeks, commenced at Sheffield College of Commerce and Technology on June 9.

TWO LARGE DEMONSTRATION UNITS, which will be used to show industrial and marine instruments manufactured by Kelvin & Hughes, Limited, at the Polish Poznan Fair (which opened on June 8), left Tilbury on June 2. The largest of the two units will, after the Poznan Fair, make a four-month tour of Hungary, Czechoslovakia, Rumania and Yugoslavia before returning home through Italy and Germany. A 9½-ton articulated vehicle, built and fitted in Britain, will carry special lighting fixtures for hospital operating theatres, electronic instruments for the detection of flaws in metal, equipment for promoting greater boiler efficiency and a ciné projector. The second unit, a Land Rover towed caravan fitted with marine instruments, will call at Polish, Western German and Belgian ports after the Poznan Fair. It carries equipment for horizontal and vertical detection of fish, as well as modern marine radar.

Mr. V. J. WOOD, chief engineer with N.S.F., Limited, radio engineers, of Keighley, on his recent re-election as president of the Keighley Association of Engineers, made an appeal for better relations in industry. He said that labour must not be regarded as a commodity or article of commerce, and pointed out that men and women still held the centre of the industrial stage, and must not be treated as cogs in a machine if working conditions were to be satisfactory. He said that the workpeople must be aware of their responsibilities in the successful process of any undertaking, and added that the personnel officer and the shop steward could play an important part in maintaining harmonious work in industry to-day. Mr. P. S. F. Simpson, who was re-elected treasurer, reported assets of £297, an increase of nearly £38. Mr. R. H. Bartle, Mr. E. D. Haigh, Mr. R. S. Pant and the secretary, Mr. G. E. Wood, were elected to the Council.

Mr. FRANCIS B. WILLMOTT, managing director of Francis B. Willmott (Dalmans), Limited, laid the foundation stone of the new £100,000 factory of the company in River Street, Deritend, Birmingham, on June 2. At the ceremony Mr. Willmott displayed two metal plaques which are to be affixed to the new building. One depicts a "multiplicity of trades" and the other the Last Supper. They were made from metal obtained by melting down the railings of Christ Church, Birmingham, which once stood, until 1898, at the corner of Colmore Row and New Street. Mr. Willmott also recalled the story of the moulder of earlier days for whom his workmates staged a whip round to help in a hardluck story which proved to be untrue. To deal with him, his fellow foundry-workers set up a trial by jury in the moulding shop, passed sentence, and buried him to the neck in moulding sand after dipping him in a bath used for cleaning metal. The cost of the new Birmingham factory is being met out of the company's own reserves. Factory space now measures about 60,000 sq. ft. "It is safe to assume a target of a million pounds turnover in the foreseeable future" Mr. Willmott said, and added that it is the company's intention to meet the requirements of larger engine units in a varied range of foreseeable applications.

National Trades Technical Societies

Mr. P. J. C. Bovill, retiring president of the National Trades Technical Societies, said at the annual conference at Mortomley High Green, on Saturday, June 7, that "the evidence and the opinion of the national executive is that the inclination of members is tending to 'on the spot' talks and to study groups in works. That is where we should provide the facilities and the knowledge people want to acquire."

Mr. W. H. Bolton, secretary, said in his annual report, that a decline in membership in Sheffield, following an increase in the annual subscription, had ended and that, next year, membership would show an increase. On technical services, he said that when a deputation went to the Ministry of Education, they were advised to make their societies more national in character by raising the educational value of their service to industry, in the sections outside Sheffield. This would provide a stronger case for financial aid, and some sections had already acted on this advice. Educational work would be developed next winter by offering special study-courses of a new type.

Mr. J. F. Stanier, of Darlington, succeeds Mr. Bovill in the presidency of the Societies. Other elections were: As vice-presidents, Mr. R. C. Benson, Mr. H. Humphries, Mr. G. E. Lunt, Mr. G. Parkin, Mr. R. H. Peacock, Mr. W. D. Pugh, Professor R. J. Sargant and Mr. L. Waring; as chairman of the National Development Committee, Mr. A. Bradley; as chairman, honours committee, Professor Sargant; as treasurer, Mr. G. Parkin; and as secretary, Mr. W. H. Bolton.

Imports and Exports of Iron and Steel in April

The following tables, based on Board of Trade returns, gives figures of imports and exports of iron and steel in April. Totals for the first four months of this year and last are also included.

Total Exports of Iron and Steel

Destination.	Month ended April 30.	Four months ended April 30.	
	1958.	1957.	1958.
	Tons.	Tons.	Tons.
Channel Islands	414	1,336	1,605
Cyprus	258	3,344	2,433
Sierra Leone	1,259	4,706	3,598
Ghana	1,523	7,706	5,424
Nigeria	5,968	21,333	21,742
Union of South Africa	10,228	37,666	38,378
Rhodesia and Nyasaland	4,749	23,378	16,363
Tanganyika	1,048	8,644	4,395
Kenya	3,373	17,793	16,836
Uganda	357	1,421	1,225
Mauritius	665	1,160	1,752
Aden	180	1,554	1,517
Bahrein, Qatar, and Trucial States	634	4,064	2,930
Kuwait	7,373	8,605	17,363
India	14,548	104,831	43,470
Pakistan	5,266	17,787	31,540
Singapore	3,160	15,832	12,484
Malaya	902	14,370	5,959
Ceylon	5,281	10,196	11,936
British North Borneo	405	1,250	879
Hongkong	4,193	37,055	16,437
Australia	8,114	71,695	28,429
New Zealand	11,319	59,999	61,786
Canada	24,448	89,405	65,306
Jamaica	1,715	6,951	7,244
Trinidad	8,116	14,338	20,034
British Guiana	727	2,113	2,565
Other Commonwealth countries	1,997	10,991	12,050
Eire	5,281	14,310	18,439
Finland	5,048	29,972	16,760
Sweden	10,613	37,914	50,816
Norway	7,476	39,817	31,765
Denmark	10,448	41,609	33,449
Western Germany	2,249	5,506	5,877
Netherlands	5,737	39,315	25,807
Belgium	2,321	13,782	8,808
France	452	6,569	1,165
Switzerland	767	7,170	4,268
Portugal	1,611	7,702	5,607
Spain	2,658	13,409	16,021
Italy	5,483	18,525	15,558
Austria	396	1,338	4,572
Yugoslavia	522	4,103	1,866
Greece	1,929	3,028	5,680
Turkey	536	2,008	1,778
Netherlands Antilles	189	1,542	582
Portuguese East Africa	108	1,671	894
Egypt	306	469	9,216
Sudan	5,376	5,456	14,096
Lebanon	2,366	1,437	7,912
Israel	662	1,640	3,252
Saudi Arabia	611	1,537	2,443
Iraq	3,051	13,905	10,667
Iran	2,397	16,864	9,867
Burma	320	6,230	3,360
Thailand	604	2,935	2,706
Indonesia	266	1,837	1,027
Philippine Republic	77	632	659
USA	5,914	16,555	26,043
Cuba	263	2,808	2,201
Colombia	1,264	1,206	3,111
Venezuela	11,334	33,975	38,174
Ecuador	128	1,243	1,273
Peru	675	5,145	4,916
Uruguay	22	2,947	439
Argentina	16,392	29,949	50,125
Other foreign countries	9,553	49,486	41,839
TOTAL	254,125	1,085,159	938,718

Total Imports of Iron and Steel

From	Month ended April 30.	Four months ended April 30.	
	1958.	1957.	1958.
	Tons.	Tons.	Tons.
Rhodesia and Nyasaland	357	1,387	2,187
Canada	1,098	14,669	5,926
Other Commonwealth countries and Eire	1,623	8,908	7,763
Soviet Union	15,711	77,785	58,066
Sweden	2,878	11,485	11,975
Norway	5,485	45,281	28,012
Poland	—	5,596	15
Western Germany	9,443	40,075	36,063
Netherlands	11,667	20,366	47,339
Belgium	8,647	59,571	35,344
Luxembourg	888	13,408	3,697
France	1,341	26,466	9,412
Italy	1,009	1,014	2,070
Austria	431	25,730	1,728
Japan	198	5,532	1,127
USA	14,841	57,523	87,870
Other foreign countries	665	11,152	1,992
TOTAL	76,282	425,948	340,586
Iron and steel scrap and waste, fit only for the recovery of metal	4,664	227,679	47,012

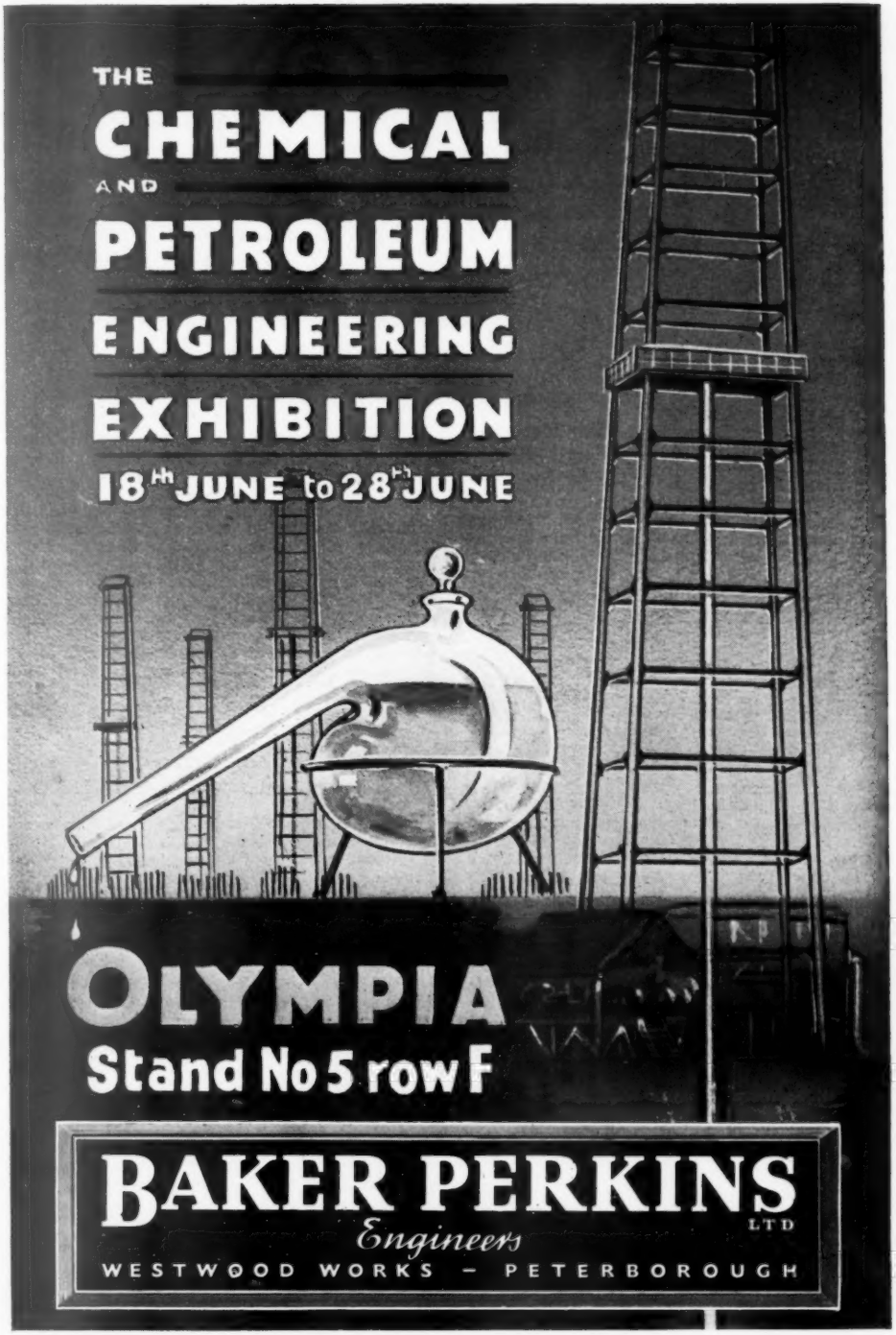
Exports of Iron and Steel, by Products

Product.	Month ended April 30.	Four months ended April 30.	
	1958.	1957.	1958.
	Tons.	Tons.	Tons.
Pig-iron	15,413	56,068	31,147
Ferro-columbium (niobium)	8	47	17
Ferro-tungsten	47	295	147
Other ferro-alloys	264	1,257	1,115
Ingots, blooms, billets, slabs, sheets, and tinplate bars	107	479	2,826
Iron bars, rods, angles, shapes, and sections	114	733	520
Steel bars, rods, angles, sections, and shapes	28,830	172,420	127,282
Iron plates and sheets	315	49	1,793
Universal plates	709	2,329	1,601
Steel plates, ⅛ in. and under ¼ in.	485	3,787	2,808
Ditto, ¼ in. and over	17,701	68,632	71,909
Blacksheets and blackplate	27,799	118,589	109,090
Hoop and strip	5,540	33,060	21,654
Tinplate	33,521	141,029	114,240
Decorated tinplate	249	1,750	901
Galvanized sheets	8,179	72,122	22,782
Other (incl. tinned sheets, terne-plate and ternesheets)	1,132	7,472	4,839
Railway and tramway construction material	20,719	84,995	83,095
Wire rods of steel (incl. alloy steel)*	3,393	17,334	12,945
Wire	6,931	38,143	35,113
Tubes, pipes, and fittings	80,098	259,628	286,519
Iron castings	1,299	699	1,990
Steel castings	269	1,122	1,113
Forgings	1,103	2,750	3,171
TOTAL	254,125	1,085,159	938,718

* The figures for 1958 are not completely comparable with those for previous years.

SCOTLAND'S first large-scale atomic reactor began working last month. The reactor, which is at Dounreay (Caithness), was started up by Dr. Robert Hurst, director of the Research Establishment. It will be used for development work connected with Britain's future programme for atomic power.

ABOUT 800 WORKERS in the farm-machinery factory at Kilmarnock of Massey-Harris-Ferguson (Manufacturing), Limited, were placed on a four-day week of 34 hours recently. This moves affects about half the workers at the plant. Orders from abroad, particularly from France, have been falling off.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Raw Material Markets

Iron and Steel

Existing contracts for the delivery of iron ore are being allowed to run their course, with the result that most works are accumulating considerable stocks. It is now certain that outputs of crude steel will not match up to last year's figures—unless there is a spectacular revival during the last four months of the year. The ironfoundries are still experiencing a thin time. Foreign markets for British steel are not nearly as strong as they were, and overseas shipments of plates, rails, and sheets are at a reduced rate.

The demand for semi-finished steel products and for light sections remains dull and the position is affected by a desire in some instances to run down existing stocks, by the restrictions on capital expenditure, which are forcing firms to draw on their reserves of material, and by the holiday period, with its customary reduction in outputs.

Scrap dealers are experiencing their worst time for years and stocks at their yards are mounting. Recently there has been an increased call from the steelmakers for better quality steel scrap, but demands for other types of scrap, notably cast-iron varieties, are very weak indeed.

Bright spots in the present position are the activity at the shipyards and heavy engineering works, largely those engaged on the construction of industrial plant on orders both from home and abroad, and the sustained demand for sheets from the motor-car industry.

Non-ferrous Metals

Copper continues to be a good market in London and has shown some improvement in New York. Continental demand has, however, taken on a more restrained appearance, which may be due to the still unsettled French situation. In any event the cash price in London yesterday (Wednesday) topped the £200 per ton mark and the US custom smelters' price, after its most recent rise, now stands at 25 cents. The American situation is interesting in that there are now small signs appearing that buying from some quarters is for restocking. For some time now the custom smelters have been doing most of the business, but now that the two prices are so close, demand for producers' copper may increase. This switch may even be dictated by the fact that offerings of scrap are only a little more than modest.

One of the talking points concerns the possible effects of the imposition of a 1.7 cents per pound duty on July 1 next. This is bound to have some effect on the differential existing as between the sterling and dollar prices and there is a body of opinion which feels that it will be the dollar quotation which will suffer.

In tin, the improvement in the Singapore price and in the demand in America has been offset by fairly large cash offerings of metal in London. This has held the price down to the floor level. Sentiment is uneasy about what Russia will do and until that position is clearer the way ahead is still unpaved for an advance. The tin restriction scheme is compelling producers in all countries to look to their costs and last week the secretary of the Associated Chinese Chamber of Commerce in Kuala Lumpur, Malaya, called on the larger Malayan tin mines to accept a larger cut in production. This, he said, was necessary if the smaller mines were to be kept working. Malaya is not the only country feeling the pinch and it was a near thing that Thailand last week decided to remain in the International Tin Council. In America the market has shown some signs of life and the price is fluctuating narrowly around 95 cents a pound.

Lead continues to experience uneventful trading conditions on both sides of the Atlantic. Last week the US price was lowered a further ½ cent, bringing the quotation down to 11 cents a pound. On its present showing the US price could go lower, although not at the moment. The US stockpiling authorities are reported to have taken in about 9,000 tons in the last tender, which is about double their usual monthly intake. Attention now is being turned towards President Eisenhower to see what action he will take on the recommendations of the Tariff Commission.

Zinc is featureless in London without being idle. In the US the offtake for special high grade from the automobile industry remains disappointing, but demand from some sections of the trade has shown signs of improvement. The basic price remains at 10 cents a pound.

Royal College, Glasgow, Extensions Opened

The new engineering block at the Royal College of Science & Technology, Glasgow, was officially opened on June 6. Some £200,000 worth of modern equipment has been installed in the six-storey building to enable the young scientists and engineers to carry on the city's tradition for providing excellent facilities for technical education. Intricate machinery has been installed in the soil-mechanics section; another room has been allocated to designing for chemical engineering; and aerodynamics is located in a third room. An adjacent section is set apart for studying mechanical systems and the technical dynamics equipment is mostly concerned with vibration and automatic control. Shortly, over 60 lecturers will be employed, and with an output of technicologists equal to that of London's Imperial College of Science, it is understandable that many will come to regard Glasgow "Tech" as being in the forefront of scientific education in the Western world.

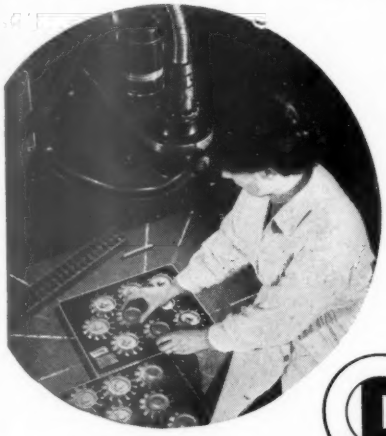
Federated's New Venture

Federated Foundries, Limited, whose announcement that they had entered the plastics industry raised hopes of employment in the Falkirk area, have stated that no immediate changes will occur in East Stirlingshire. At their recent annual meeting the chairman, Mr. W. Rennie, announced that the purchase of the whole share capital of Arlington Plastics Developments, Limited, and Arlington Plastics (Export), Limited, whose main products are various classes of plastic-coated fabrics, had been made in January. Despite the fact that the directors of Federated Foundries expect trade generally to be at a lower level this year and orders difficult to secure, a spokesman said recently that he did not think any immediate effect of the purchase of the English plastics factory would be felt in the Falkirk area.

Recent Wills

BROWN, J. A., former director of Allied Ironfounders, Limited, and for 60 years associated with the ironfounding industry £323,204

GEARY, WILLIAM, former administrative works manager at the steelworks of the Appleby-Frodingham Steel Company (branch of the United Steel Companies, Limited), a Fellow of the Institute of Metallurgists, secretary of the Advisory Committee on Open-hearth Furnaces, and chairman of the British Iron and Steel Research Association's junior steelmaking section £11,061



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Current Prices of Iron, Steel, and Non-ferrous Metals

(*Delivered unless otherwise stated*)

June 11, 1958

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £23 17s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £24 1s. 3d.

Scotch Iron.—No. 3 foundry, £25 3s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 19s. 0d.; South Zone, £26 1s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £27 6s. 6d.; South Zone, £27 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £25 6s. 6d.; Scotland (Scotch iron), Zone S.1, £25 13s. 0d.; Sheffield, £26 15s. 0d.; Birmingham, £27 4s. 0d.; Wales (Welsh iron), £25 6s. 6d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics.

FERRO-ALLOYS

(*Per ton unless otherwise stated, delivered*)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £47 0s. 0d. to £47 10s. 0d., scale 17s. 0d. per unit; 75 per cent. Si, £66 0s. 0d. to £66 10s. 0d., scale 17s. 0d. per unit.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 7s. 4d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 10s. 4d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £91 10s. 0d., basis 60 per cent. Cr, scale 30s. 0d. to 30s. 6d., per unit; over 6 per cent. C, £87 10s. 0d., basis 60 per cent. Cr, scale 30s. 6d. per unit; 2 per cent. C,* 2s. 0d. per lb. Cr; 1 per cent. C,* 2s. 0½d. per lb. Cr; 0.15 per cent. C,* 2s. 1½d. per lb. Cr; 0.10 per cent. C,* 2s. 1½d. per lb. Cr; 0.06 per cent. C,* 2s. 2d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 2½d. to 7s. 9½d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £265 0s. 0d.; 96/98 per cent., £295 0s. 0d.

Ferro-columbium.—65/72 per cent., Nb + Ta, 19s. 9d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £83 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., £32 15s. 6d.; tested, 0.08 to 0.33 per cent. C, £33 15s., 6d.; hard (0.41 to 0.60 per cent. C), £34 17s. 0d.; silico-manganese, £43 16s. 6d.; free-cutting, £36 14s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

* Average 68-70 per cent.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £42 2s. 0d.; boiler plates (N.-E. Coast), £44 12s. 0d.; floor plates (N.-E. Coast), £43 11s. 0d.; angles (N.-E. Coast), £39 16s. 6d.; joists (N.-E. Coast), £39 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats, 5 in. wide and under, untested soft basic, 50 tons and over: £40 0s. 6d; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, £39 0s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £44 16s. 0d.; black sheets (hand mill), 24g., £58 14s. 6d.; galvanized corrugated sheets, 24g., £66 16s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £68 10s. 0d.; nickel-chrome, £99 11s. 0d.; nickel-chrome-molybdenum, £111 19s. 0d.

NON-FERROUS METALS

Copper.—Cash, £197 15s. 0d. to £198 5s. 0d.; three months, £200 0s. 0d. to £200 10s. 0d.; settlement, £198 5s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 1s. 9¾d. per lb.; rods, 210s. 9d. per cwt. basis; 20 s.w.g., 244s. 0d. per cwt.

Tin.—Cash, £730 0s. 0d. to £730 10s. 0d.; three months, £734 10s. 0d. to £735 0s. 0d.; settlement, £730 10s. 0d.

Lead (Refined Pig).—First half June, £71 5s. 0d. to £71 7s. 6d.; first half September, £72 0s. 0d. to £72 2s. 6d.

Zinc.—First half June, £62 17s. 6d. to £63 0s. 0d.; first half September, £63 12s. 6d. to £63 15s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £96 5s. 0d.; rolled zinc (boiler plates), all English destinations, £94 0s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £83 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 5¾d. per lb.; sheets to 10 w.g., 158s. 9d. per cwt.; wire, 2s. 3¾d.; rolled metal, 158s. 9d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £131; B6 (85/15), £165; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £164; HTB2 (38 tons), — ; HTB3 (48 tons), —.

Gunmetal.—BS1400, LG2 (85/5/5/5), £156; LG3 (86/7/5/2), £165; G1 (88/10/2/½), £225; (88/10/2/1), £215.

Phosphor Bronze.—BS1400, PB1 (AID released), £245 per ton.

Phosphor Bronze Strip, etc.—Strip, 234s. 3d. per cwt.; wire, 3s. 6¾d. per lb.; rods, 2s. 10¼d.; tubes, 2s. 10¼d.; chill cast bars: solids 2s. 10¼d.; cored 2s. 11¼d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 5¼d. per lb.; round wire, 10g. in coils (10 per cent.), 3s. 10¼d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 3s. 9¼d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5¼d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £76 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £180 0s. 0d.; aluminium bronze (BS1400), AB1, £193; AB2, £202.